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HIGH AND DRY: INSTITUTIONAL IMPEDIMENTS TO EFFECTIVE DROUGHT MANAGEMENT AND RELIEF IN THE 1995-96 AND 1998 OKLAHOMA DROUGHTS

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HIGH AND DRY: INSTITUTIONAL IMPEDIMENTS TO EFFECTIVE DROUGHT MANAGEMENT AND RELIEF IN THE 1995-96 AND 1998 OKLAHOMA DROUGHTS

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BY

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Dedicated to my parents, Rev. Charles R. Lawson and Orgla P. Lawson.
Thank you for teaching stewardship of the Earth.

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Abstract

This thesis examines the abilities of government entities and non-governmental organizations (NGOs) in Oklahoma to work in concert using institutional and organizational learning precepts to effectively plan for and mitigate the effects of drought. Drawing from academic literature in the areas of organizational learning, drought prediction, planning and mitigation and Oklahoma agricultural production, specifically in the areas of wheat and cattle operations, and newspaper articles in the areas of Oklahoma drought prediction, planning and mitigation, Oklahoma agricultural production, heat wave and wildfire it paints a more complete portrait of drought mitigation in Oklahoma. It develops this portrait with interviews of key individuals. Finally, survey results from a University of Oklahoma drought study provide insight into the details of mitigating drought in Oklahoma from the perspective of fire, emergency management and agricultural staffs.

The droughts of 1995-96 and 1998 forced intricate inter-agency planning and mitigation between, for example, the Oklahoma Department of Civil Emergency Management, the Oklahoma Water Resources Board, the Oklahoma Department of Agriculture, and non-governmental organizations such as Feed the Children. The state government failed to experience significant learning on the double loop level, although some individual agencies, did experience single loop learning. One attempt at learning occurred during the year between the two droughts, 1997, when the state of Oklahoma authored a drought plan which this study finds seriously lacking. The plan only suggests responses; does not address responses for consistently recurring problems such as water shortages; does not contain specific, detailed instruction for implementing responses and suggests collaborations between agencies and entities that no longer exist. It provides no one agency with directorial powers. As far as one can determine from a comparison of historical data from both droughts, the plan made little to no difference in actual mitigation.

Introduction

This thesis examines the abilities of government entities and non-governmental organizations (NGOs) in Oklahoma to work in concert using institutional and organizational learning precepts to effectively plan for and mitigate the effects of drought. The droughts of 1996 and 1998 forced intricate inter-agency planning and mitigation between, for example, the Oklahoma Department of Civil Emergency Management, the Oklahoma Water Resources Board, the Oklahoma Department of Agriculture, and non-governmental organizations such as Feed the Children.

The inter-agency response was conducted largely without a central lead agency. Although the drought contingency plan was formulated under the leadership of the Oklahoma Department of Emergency Management and the Oklahoma Water Resources Board, the response had no lead agency that controlled overall mitigation actions. In accordance with State Executive Order 96-24, the director of the State Department of Civil Emergency Management assumed the post of State Drought Coordinator heading the Oklahoma Drought Management Team. The team met during the drought episode to discuss conditions and mitigation techniques, but had no ultimate authority to order agency action. The team consisted of representatives of the following state agencies:

- ☑ Oklahoma Water Resources Board
- ☑ Department of Agriculture
- ☑ Department of Civil Emergency Management
- ☑ Oklahoma Climatological Survey
- ☑ Forestry Services
- ☑ Agricultural Statistics Service
- ☑ Department of Wildlife Conservation
- ☑ Department of Environmental Quality
- ☑ Oklahoma Conservation Commission
- ☑ Oklahoma State Department of Health
- ☑ Oklahoma State University Extension Service
- ☑ Oklahoma Municipal League
- ☑ Oklahoma Rural Water Association
- ☑ Association of County Commissioners of Oklahoma.

This absence of a clear lead agency created slow responses to the drought in many areas, among them agricultural relief and water conservation. Ranchers and farmers commented that they received aid only after the damage to crops and cattle was already done ("Taylor rallying for drought relief for Mayes, Rogers Co. hay farmers," *Pryor Times*, July 7, 1996; "Nickles views drought area,"*Guymon Herald*, June 1, 1996; "Drought aid set for some," *Kingfisher Times & Free-Press*, June 2, 1996; Oklahoma in Grip of New Dust Bowl," *The Christian Science Monitor*, August 24, 1998; "Drought Stampeding Cattle to Sale Barns," *The Daily Oklahoman*, July 18, 1998). A related problem was caused by lack of communication between mitigation agencies and agricultural producers. Producers stated repeatedly to the press that the types of aid they required, such as relaxation of regulations and restrictions, went unprovided while aid types that had failed in the past, such as low-interest loans, were offered ("More Than the Land, Drought Scorches Spirit," *The Sunday Oklahoman*, May 26, 1996; "Unrelenting heat has dire implications for state's farming future," *The Norman Transcript*, July 26, 1998; "Drought Drives Grasshoppers To Extremes," *The Daily Oklahoman*, July 26, 1998; "Heat-Ravaged Counties Eligible For Disaster Aid," *The Daily Oklahoman*, 1998).

The meteorological drought response of 1996 was no better than the agricultural response. Fire fighters faced a rash of wildfires without enough water to put them out. The Department of Forestry and Oklahoma Department of Civil Emergency Management's replacement of Palmer Drought Severity Index (PDSI) with J.D. Carlson's Fire Danger Model in 1996 brought an improvement in identification of burning conditions and fire complexes (Meo and Mahmood, 1999) which continued into 1998. However, municipalities continued to conduct poor water conservation measures in 1998. Many cities implemented mandatory water rationing too late to stop shortages, then failed to enforce rationing violations with fines. For instance, in 1998, Oklahoma City did not begin rationing water until July 13 when

its largest distribution line failed ("City Halts Water Curbs As Long Hot Spell Ends," *The Daily Oklahoman*, August 5, 1998). Norman residents created a public health hazard with their water overuse though the city had instituted a water rationing plan:

"We're really down to a health and safety hazard now," said City Manager Ron Wood. "I've had three calls this morning from folks on dialysis machines that can't get enough pressure to operate them." ("Greater Conservation Sought," *The Norman Transcript*, July 24, 1998).

Organizational learning mores and theories (Ventriss and Luke, 1988; Richards, 1994) suggest the state should have learned from the 1996 drought and responded differently in 1998. In most cases this did not occur. What did occur was what Covington calls faulty organizational learning which leads to "learning that does not improve an agency's performance" (1985: 174). Though wildfire response improved significantly in 1998, agricultural producers continued to suffer, as did water resources.

The literature generally applies organizational learning intraoganizationally, but in the case of drought mitigation in Oklahoma one must look at it as an interorganizational action within one super entity. The state government, functioning as a mitigation unit through creation of the Oklahoma Drought Management Team, takes super entity status, with each agency or sub-agency of the state and the non-governmental organizations functioning as an element of the super entity, as well as a stand alone agency. This means that, ideally, the super entity and its elements should experience substantive learning as defined by Ventriss and Luke (1988:338), where public administrators "critically reflect (and act) upon the intended and unintended substantive outcomes of enacted organizational policies in an intergovernmental and intersectoral environment" to enlarge the scope of learning. It didn't.

Organizational learning by public bureaucracies presents a difficult task which some researchers believe bureaucracies cannot overcome. Ventriss and Luke cite Paul Shrivastava's assertion that "these organizations adopt sub-optimal, rational, and wasteful patterns of behavior in decision making, because they do not know better ways... [so] learning occurs in stepwise, incremental, progression of small adjustments [that] are moderated by intra-organizational conflicts and bureaucratic procedures" (Ventriss and Luke, 1988).

Organizations that *do* learn, tend to do so on a single-loop level that focuses on "detection and correction of errors through organizational adjustment in a fixed content" (Ventriss and Luke, 1988). But the double-loop level of learning that could improve total organizational performance is rarely reached. "Double-loop learning links the detection of error to questions concerning the basic underlying organizational norms" (Ventriss and Luke, 1988). The single-loop learning process enables the organization to carry out its present policies to achieve its objectives. The double-loop learning process occurs when policies and goals are questioned and altered (Barth, 1996). Succinctly, the difference between single and double loop learning equals the difference between error-correcting and error-preventing (Ventriss and Luke, 1988).

Between the 1995-1996 drought and the 1998 drought some agencies, such as the Forestry Service, experienced single-loop learning. For instance, the agency realized the insufficiency of the PDSI for use in fire suppression and replaced it with J.D. Carlson's fire danger model which includes the Keetch-Byram drought index (Meo and Mahmood, 1998). The state chose to utilize inter-agency collaboration without an ultimate decision-making or lead agency so while learning could occur at the agency or sub-agency level to effect one area of drought mitigation, it failed to attain an overall level or proceed in a coordinated manner. I assert that this inability to learn throughout agencies, the lack of a lead agency to foster learn-

ing and to implement mitigatory actions, lack of an usable early warning system for drought, an inability or unwillingness to implement necessary agricultural mitigation techniques from the first drought stages, and a communication breakdown between government agencies and the public (including agricultural producers) led to economic and social losses and a diminished level of preparedness and response to identified inputs.

Methodology

First, an extensive academic literature search was conducted in the areas of organizational learning, drought prediction, planning and mitigation and Oklahoma agricultural production, specifically in the areas of wheat and cattle operations. Second, a newspaper article search of the areas of Oklahoma drought prediction, planning and mitigation, and Oklahoma agricultural production was conducted. The media often acted as a talkback device for the agricultural producers and public as a whole. These articles also provided an integral tool for building a timeline of response to the drought. Third, from these news articles key individuals were identified for interviews. These interviews provided insight into why agricultural response did not improve between 1995-96 and 1998 and what changes are needed to better mitigate Oklahoma's next drought. Finally, survey results from a University of Oklahoma drought study provide insight into the details of mitigating drought in Oklahoma from the perspective of fire, emergency management and agricultural staffs. (The University's Science and Public Policy Program conducted a survey of agricultural, wildfire and emergency management personnel who participated in the mitigation of either the 1995-96 or 1998 droughts or both. The survey was a part of a National Oceanographic and Atmospheric Administration funded study, "Climate Prediction, Information, and Policy Response: A Retrospective Assessment of Drought Management in Oklahoma.")

Chapter 1
Droughts: Planning and Mitigating

Defining drought

Drought has been called an undefinable natural hazard. Little agreement exists on what constitutes a drought and to add to the problem, there are many different types of drought, including meteorological, hydrological, agricultural and socio-economic. Each represents a separate facet of an absence of the same basic atmospheric activity, precipitation. Donald Wilhite points out the need for two types of definitions, one conceptual, the other operational. The conceptual definition deals in general terms. It helps people understand the concept of drought and provides a focus for development of drought policy (Wilhite, 1993). The operational definition uses specific, measurable scientific data to determine the beginning, end, and severity of a drought. Many drought indices exist to determine the existence of a drought, though some are tailored for dealing with short-term droughts while others focus on long-term droughts. (A more detailed discussion of drought indices comes later in this chapter.)

As the Alberta Disaster Preparedness division points out in its online planning documents, "There is no one definition that works in all circumstances (Her Majesty the Queen in the Right of Alberta, 2000)." Broadly however, the encyclopedia calls drought a "condition of abnormally dry weather within a geographic region where some rain might be expected." It points out that drought should not be confused with a dry climate, in which a region experiences at least seasonal dryness (Microsoft Encarta Online Encyclopedia, 2000). Wilhite explains that a drought "is a normal part of climate and it's recurrence... is inevitable." He further explains since drought is a *regional* event, then its definition must also be regional or local specific (Wilhite, 1993:3). This promotes problems since the meteorological norms for a even a small area, such as a single state in the United States, can vary greatly from county to county. This is the case for Oklahoma.

The effects of drought accumulate slowly making the beginning and end of

a drought hard to define. It may begin in a small area and expand to a large regional effect, then shrink again causing it to differ from most other natural hazards which have steady *epicenters* of impact.

The definition must also refer to the drought's *intensity*, or the degree of the precipitation shortfall and/or severity of impacts. An extended definition needs to cover direct and indirect first (biophysical), second (byproducts of biophysical) and third (byproducts of second order) order impacts including economic, environmental and social impacts and the sequences thereof (Wilhite, 1993).

The definition must also consider the drought's *duration.* A generally accepted American minimum of two to three months constitutes a drought but the same drought can continue for years. The British provide a broader definition, stating that "an absolute drought is a period of at least 15 consecutive days to none of which is credited 0.01 inches of rain or more (Meteorological Glossary, 1944)."

The definition should also incorporate the *frequency* with which an area or region experiences drought. Australian drought policy recognizes that drought is part of its normal climate and requires that its agricultural community incorporate the inevitability of drought as a part of normal risk management planning. It provides financial assistance to farmers only when an area experiences "exceptional drought circumstances." The National Drought Mitigation Center reports that before the development of the country's current drought definition, farmers there "claimed drought assistance every few years." The government's expanded drought definition helped it develop better policies while also helping farmers to understand the regularity of drought as a meteorological event (NDMC, 1995).

Wilhite (1993) writes that drought is a "consequence of natural reduction in amount of precipitation received over an extended period of time." Other climatic factors such as heat wave, high winds and low relative humidity can exacerbate it.

Some drought definitions focus solely on the basis of the degree dryness and duration of dry period but a definition should also include consideration of the timing and effectiveness of rains.

Combining these varied definitions then, conceptually, drought is a distinctly regional, normal climatic event caused by an extended precipitation shortfall sometimes accompanied by a heat wave and/or exacerbated by high winds and/or low relative humidity. Though drought's effects accumulate slowly making its beginning and end tough to determine, a two to three month shortfall generally constitutes the minimum length while a drought may stretch into consecutive or non-consecutive years. Its effects may spread throughout a large geographical area, evolving gradually, with the epicenter of impact shifting over time while its intensity is determined by the timing and effectiveness and degree of shortfall of precipitation.

Meteorological Drought

Drought definitions have evolved since the technical British definition discussed above which was first published in 1887. For instance, the British definition did not refer to the abnormality of the drought's occurrence in an area. The American Meteorological Society recognized this in its definition for the Glossary of Meteorology. It called drought "a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area (Huschke, 1959)." This definition, however does not include the impact effects from the lack of water. Warwick's (1975) definition adds to the idea of the abnormality of the precipitation shortfall the impacts. He defines meteorological drought as a "condition of moisture deficit sufficient to have an adverse effect on vegetation, animals, and man over a sizeable area." Finally, Wilhite's (1993) definition considers drought "relative to some long-term average condition of balance between precipitation and evapotranspiration in a particular area." He defines

meteorological drought on the basis of degree of dryness and duration of the event.

Each definition contains elements one needs to understand the true concept of meteorological drought. By putting them together one finds that conceptually a meteorological drought results from a prolonged moisture deficit of at least 15 consecutive days of 0.01 inches or less precipitation in an area where precipitation would normally be expected, causing an adverse effect on flora and fauna including humans.

Hydrological Drought

Hydrological drought is actually associated with meteorological drought. Broadly, it refers to a decline in surface and subsurface water (Her Majesty the Queen in the Right of Alberta, 2000). One sees a slight but notable difference in Yevjevich, Hall and Salas' (1977) definition and Wilhite's - the latter requires a precipitation shortfall while the former defines hydrological drought as any "period of below average water content in streams reservoirs, groundwater aquifers, lakes and soils . Wilhite associates hydrological drought with the "effects of periods of precipitation shortfalls on surface or subsurface water supply frequency and severity of hydrological drought defined on a watershed or river basin scale." This means that if using Yevjevich, Hall and Salas' definition, a meteorological drought need not be present to cause a hydrological one. For instance, a heatwave alone could cause a "period of below average water content" though the standard amount of precipitation fell. Using Wilhite's definition, a deficiency of precipitation must be present.

Wilhite also points out that the hydrological drought will often occur out of phase with or lag meteorological and agricultural droughts. This type of drought may also effect hydroelectric power production or recreational uses and can cause an escalation in competition for water in storage systems and a significant increase in conflicts between water users (Wilhite, 1993).

Why the difference in causes of this type of drought? As mentioned before, Wilhite recommends use of regional drought definition. By looking at drought as an historical event in Oklahoma, one finds that a precipitation shortfall has generally been associated with its drought events. So, in Oklahoma, a hydrological drought is a period of precipitation shortfall that results in a below average content in natural and manmade surface and sub-surface water systems that may affect water utilization by residential and business users, hydroelectric power production and/ or recreational uses.

Agricultural Drought

Agriculture is usually the first industry in Oklahoma to feel the effects of drought so one needs a conceptual definition of the phenomenon. Alberta's emergency management agency uses the basic definition of "when there is not enough water available for a crop to grow (Her Majesty the Queen in the Right of Alberta, 2000)." Rosenburg (1979) says almost the same thing, couched in more academic language but adds the element of cattle operations. He defines agricultural drought as "a climatic excursion involving a shortage of precipitation sufficient to adversely affect crop production or range production." Finally, Wilhite says agricultural drought links the characteristics of meteorological or hydrological drought to agricultural impacts with a focus on precipitation shortages. Specifically, it is the difference between actual and potential evapotranspiration, with soil water deficits, reduced ground water or reservoir levels (Wilhite).

The National Drought Mitigation Center gives direction for development of new definitions. It says, "(A regional) definition needs to account for variable susceptibility of crops during different stages of crop development, from emergence to maturity (NDMC/ Wilhite)." Wilhite agrees the definition must account for a plant's demand for water which hinges on weather conditions, biological characteristics of plant, stage of growth, physical and biological properties of soil (Wilhite).

From these definitions and Wilhite's observations on regional definitions, one can say that in Oklahoma, agricultural drought occurs when the characteristics of meteorological and/or hydrological drought impact a crop(s)'s growing season or a livestock development phase by creating soil water deficits and reducing ground water levels resulting in stunted growth.

Socio-economic drought

So far only those types of droughts that affect the natural environment have been examined. Socio-economic drought considers "when the physical water shortage begins to affect people (Her Majesty the Queen in the Right of Alberta, 2000)." As Wilhite (1993:7) explains, it "associates (the) supply and demand of some economic good or service with elements of meteorological, hydrological, and agricultural drought." Generally, the economic good is weather-dependent so when demand exceeds supply as a result of a weather-related supply shortfall a socio-economic drought ensues. Poor land-use practices such as overgrazing, can exacerbate the effects of this type of drought. Overgrazing decreases animal carrying capacity and increases soil erosion increasing impacts and future drought impacts (Wilhite, 1993). An example of this occurred in the 1998 Oklahoma drought when hay supplies dwindled so low that the state transported it in from neighboring states. Another Oklahoma example occurred when low-income residents could not afford air conditioning or fans during the heat wave, causing illness and in some cases, death.

So, combining these definitions as a whole, a socio-economic drought occurs when a meteorological, hydrological or agricultural drought causes a physical shortage of some economic good or service, such as water or hay, that affects the people of an area.

Mitigating drought

Though droughts are a normal, inevitable climatic feature and a commonly

occurring natural hazard, many governments lack preparedness to mitigate this hazard. This results in part, because drought mitigation spans the jurisdiction of numerous bureaucratic organizations and governmental levels. Because of this, competing interests, institutional rivalry, and protection of agency missions impede drought assessment and mitigation. As Donald Wilhite (1993) notes, few national response efforts have managed to reduce drought vulnerability and most countries have made little progress toward preparedness.

Evaluations have found that nations and states with a low level of preparedness produced ineffective, poorly coordinated, untimely drought response with inefficient allocation of resources (Easterling and Wilhite, 1987; Wilhite, 1996). Though some governments have moved to more proactive approaches to reduce short term impacts and long term vulnerability, many continue to rely on crisis management.

Because droughts constitute an inevitable natural hazard, a management or mitigation plan is needed to combat their ravages. However, a proliferation of constraints stand in the way of drought planning. These include:

- ☑ lack of understanding of drought by politicians, policy makers, technical staff, and the general public
- ☑ lack of communication and cooperation among scientists and policy makers on the significance of drought planning
- ☑ inadequate financial resources
- ☑ competing institutional jurisdictions between and within levels of government
- ☑ droughts' infrequent occurrence which encourages the hydro-illogi cal cycle (see Illustration 1.1)
- ☑ difficulties in predicting and detecting drought
- ☑ insufficient data bases and
- ☑ inappropriate mitigation technologies (Wilhite, 1993).

Planning for drought

Since proper planning can mitigate and sometimes prevent impacts, many researchers have worked to create strategies to combat these constraints. Some

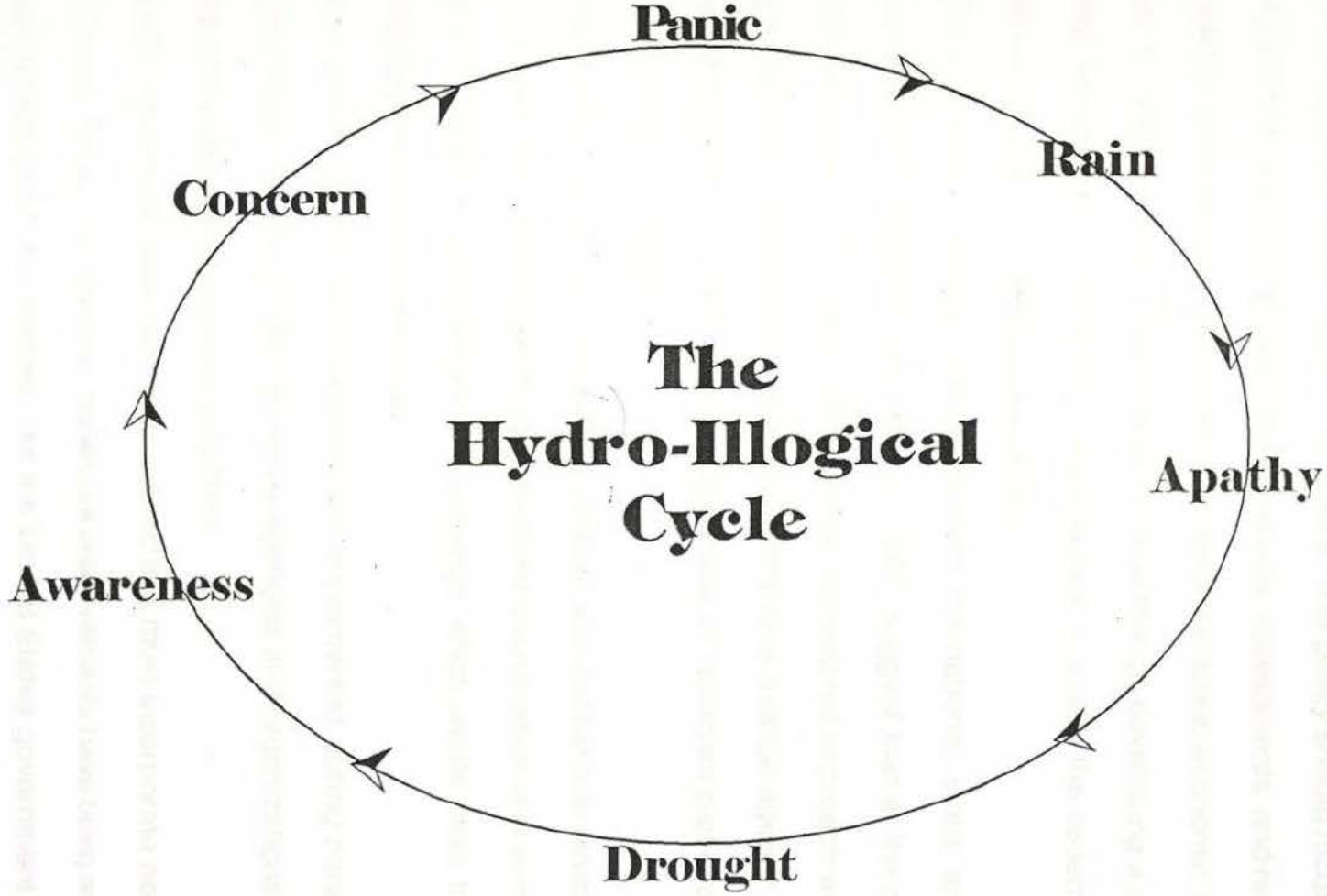


Illustration 1.1 (Wilhite, 1993)

generally agreed-upon guidelines to drought planning therefore exist. First, national government should set policy for assessment and response to drought, considering both long and short droughts in the policy. This policy should focus on the need for infrastructure to provide basic data, analysis, assessments, and research. Effective impact assessments would focus, at least, on basic economic aspects (Task Group 5, 1987). Wilhite (1993) points out that though developing a national or provincial drought policy and plan is complicated, it is also the essential first step toward a reduction of societal vulnerability.

Second, drought planning should integrate the national, state, and local levels of government. Easterling and Wilhite (1987) suggest that at the national level in large countries such as the United States, the optimal approach would be an interagency policy development under the leadership of a single agency. Therefore, consensus building between agencies becomes an important part of creating a drought plan (Wilhite, 1993).

Drought planning should use existing political and institutional structures to minimize start-up and maintenance costs. Improved coordination and elimination of duplication of effort should produce cost savings which would ease the constraint of inadequate financial resources.

Third, planning must be undertaken and implemented during nondrought periods. One reason for this is that it provides agencies and organizations time to test procedures under mock disaster conditions.

Fourth, the drought plan must be dynamic and must incorporate new technologies (Wilhite, 1993). For instance, significant improvements have been achieved in the development of drought indices, but the United States government continues to use the Palmer Drought Severity Index though its weaknesses have been catalogued for many years (Hayes, 1999; Taylor, Stewart and Downton, 1987). Annual or biennial review of drought policy and plan(s) would provide opportunity

to change to more recent technology. Plans should be coordinated into the general natural disaster plan or water resources and development plans.

To facilitate disaster mitigation in the area of droughts, Wilhite (1993; 1996) developed a ten step method for drought planning. The method evolved from 1987 to 1991 through the input of participants in a series of international symposiums and workshops . Table 1.1 presents the ten essential steps in the planning process as reprinted from Wilhite (1993; 1996).

The planning process initiates through the appointment of a national/state drought authority or commission. (Step 1) which supervises and coordinates the development of the plan. After implementation and during droughts, the commission acts as policy coordinator. It should include representatives from the most relevant mission agencies and a media representative or public information specialist to facilitate promoting public awareness of drought. The commission also determines how to formalize the plan (whether by legislation or inclusion in the emergency management plan). "The danger in not formalizing the plan is that change in political or administrative leadership may lead to the decay of the plan's infrastructure (Wilhite, 1993:92)." Political interest quickly wanes and institutional memory is short, Wilhite stresses.

The commission then develops the drought policy, a broadly stated policy that expresses the purpose of government involvement in drought assessment, mitigation, and response. Lack of these objectives makes effective assessment of mitigation (Step 10) particulary difficult. Wilhite (1993) includes three proposed objectives. First, the government should only offer assistance that encourages agricultural producers, municipalities and others to adopt appropriate and efficient management practices that will help alleviate drought effects. Wilhite finds that the United States, among other countries, discourages self-reliance by providing mitigation techniques that encourage inappropriate management practices, rather than

each business planning for drought as an inevitable risk. Second, any provided assistance should be given in an "equitable, consistent and predictable manner" regardless of economic circumstances, industry or geographic region. Third, the importance of protecting the natural and agricultural resource base through sustainable actions is emphasized (Wilhite, 1993).

These objectives should address the three components that form a drought policy: organization, response, and evaluation. Organizational components consist of planning activities that provide timely, reliable assessments, an early warning system, and coordinated procedural response. Response components consist of assistance measures and related associated administration procedures to provide relief to the public. Evaluation components consist of procedures for examining the organizational and response components to determine strengths and weaknesses. Government response efforts seldom include an evaluation component, Easterling and Wilhite (1987) state, and, as a result, the mistakes of the past are often repeated.

Development of this policy should include an evaluation of all pertinent government programs to ensure their missions and/or actions do not conflict with drought policy goals. After authoring these broad objectives, the commission should develop specific objectives (Wilhite, 1993). (See Wilhite p. 96 and 97 for specific suggested objectives.)

Wilhite defines drought planning as "actions taken by individual citizens, industry, government, NGOs, and others in advance of drought for the purpose of mitigating some of the impacts and conflicts associated with its occurrence." Successful drought planning integrates levels of government and involves the private sector early in the process.

Step 3 encourages development of a drought advisory council made up of citizens as a permanent feature of the drought plan. The council assists the com-

mission in information flow and conflict resolution between water users and provides a forum to address public interests and environmental concerns. The public needs to receive balanced, frequent, thorough, and accurate news of conditions and changes accomplished by providing concise, understandable news releases for use in media reports.

By inventorying the natural, biological, human resources and financial and legal constraints (Step 4), the commission determines the vulnerability of these to water shortages resulting from drought. This assessment reveals possible inhibitions to Step 2 objectives (Wilhite, 1993).

Step 1: Appointment of National (or State) Drought Commission
Step 2: Statement of Drought Policy and Plan Objectives
Step 3: Avoiding and Resolving Conflict between Environmental and Economic Sectors
Step 4: Inventory of Natural, Biological, and Human Resources and Financial and Legal Constraints
Step 5: Development of Drought Plan
Step 6: Identification of Research Needs and Institutional Gaps
Step 7: Synthesis of Scientific and Policy Issues
Step 8: Implementation of Drought Plan
Step 9: Development of Multilevel Educational and Training Programs
Step 10: Development of Drought Plan Evaluation Procedures

Illustration 1.2 *Wilhite's 10-Step Method*

Next, (Step 5) the National Drought Commission, working with the public develops the drought plan. As conditions deteriorate, this plan should follow a stepwise or phased approach that integrates national/state response with county and local response. A drought plan needs three primary organizational components: monitoring, assessment of impact and response. To administer these components Wilhite reccomends two committees created from the NDC, the Water Inventory and Outlook Committee and the Impact Assessment Committee (1993).

The Water Inventory and Outlook Committee handles monitoring. Its main duties include inventorying data availability and existing observational networks, determining primary user needs, developing/modifying current data to better serve

user needs, defining drought, developing a response schedule and early warning system and identifying drought management areas. This is a permanent committee that, to function ideally, should meet on a monthly basis.

Impact assessment needs to occur on multiple levels, examining first order impacts, such as depressed crop yields, and using the natural hazards approach, which focuses on social/psychological impacts, such as citizens' actions due to drought (Easterling and Riebsame, 1987).

Composed of an interagency team, the Impact Assessment Committee (IAC) represents the economic sectors most likely affected by drought. It should include university scientists with expertise in early impact estimations. The committee needs to consider both direct and indirect losses. The two committees are interdependent and frequent inter-committee communication is essential to effective drought mitigation (Wilhite, 1993).

Agencies responsible for monitoring and/or early warning systems must obtain feedback from users at each level to properly modify products to better serve users. Decision makers may not understand or know how to use the information provided. Without proper education and training, users such as farmers and ranchers can not effectively use the provided information (Easterling and Wilhite, 1987).

The National Drought Commission, composed of senior-level policy officials, handles the response component of the plan. It acts on information and recommendations of the IAC and evaluates available drought assistance from all sources for short- and long-term relief. Wilhite (1993) defines drought assistance as occurring on three timescales: short-term, medium-term, and long-term. Short-term measures consist of reactive measures implemented during drought. Medium-term measures consist of recovery measures implemented to reduce the post-drought recovery period. Long-term measures consist of proactive measures implemented to reduce societal vulnerability to drought. Assistance from all timescales

should help achieve Step 2 objectives.

Simultaneous with development of the plan, the Drought Commission should identify research needed to support plan objectives and recommend research projects to mitigate existing deficiencies. This step may require alteration of various agency missions or legislative action.

Step 7 focuses on synthesizing scientific and policy issues and fostering a working relationship between scientists and policy makers. Communication between these two groups is poorly developed. Wilhite stresses that direct and extensive contact between these groups constitutes an imperative to successful drought planning.

Next, the government should implement the drought plan (Step 8) just before the most drought-sensitive season. This capitalizes on public and media interest. Since it will act as a major conveyor of information to the public, the media should receive extensive educational information including the plan's rationale, purpose, objectives, assessment and response procedures and the organizational framework.

Personnel training constitutes a critical action of the plan because if personnel at all levels do not understand their duties and responsibilities and how to carry them out, the plan will fail. The government should test the drought plan under simulated conditions before implementing it . This tests not only the feasibility and timeliness of the plan's response mechanisms but, also, the effectiveness of the training. The government should conduct disaster simulations during periods of drought absence to keep personnel abreast of response techniques (Wilhite, 1993).

While Step 8 addresses personnel and media education, Step 9 focuses on the need for public education and reaffirms the need for media education. This educational process should work toward achieving multiple objectives, including

increasing public awareness of drought and water conservation and ways citizens, businesses, and organizations can help mitigate impacts at all levels.

Governments need to encourage drought mitigation at the citizen level. Part of this encouragement comes through discovering indigenous practices relied on by agricultural producers, especially those relating to risk/loss minimization and management. States need to develop local political and economic institutions to aid farmers and ranchers, among other impacted populations (Task Group 4, 1987).

National and state government needs to develop assistance measures that lead producers to incorporate risk management into farm business plans (Wilhite, 1987). The practice of government assistance can become a disincentive for self-reliance and sustainable use of the land. "In fact, vulnerability to drought has increased in some settings because of relief recipients' expectations for assistance from government or donors" (Wilhite, 1993). Task group 4 from the drought symposium found that infrastructure constitutes the most important component of a national drought strategy, specifically focusing on the development of grain and other food reserves including provisions for livestock, transportation system development for delivery of relief aid, and organization of water resources for emergency provision of water for crops, people, and animals (Task Group 4, 1987).

Finally, the government must create a detailed set of evaluation procedures for two modes: ongoing and post-drought evaluation. The ongoing evaluation looks at drought planning as a dynamic process that must remain responsive to changing state needs. This step includes periodically reviewing and revising the drought plan. The government should conduct or commission the post-drought mode evaluation immediately following each drought episode to foster learning from experience and combat fading institutional memory. This should include an analysis of the drought's impacts on soil, groundwater, plants, animals, the economy and society, and the extent to which predrought planning helped mitigate impacts, deliver

assistance and aid in post-drought recovery. Wilhite (1993) provides a number of specific questions that need addressing in this assessment. Since providing an unbiased appraisal is key, the government should commission this evaluation from a non-governmental organization such as a university or corporation.

Task group 5 from the symposium on drought stresses the importance of cataloguing the experiences of each drought through response evaluations. "The best guide to the future is past experience and the lessons learned from it," Wilhite says (1987:563). The task group further states that the government should implement findings from these evaluations (Task Group 5, 1987).

Wilhite (1987) found four key areas in which the United States needed to improve its drought response: reliable and timely information products, improved impact assessment techniques, centralized designation and revocation procedures, and adoption of a proactive approach to drought assistance. The author continually expressed the need for a single lead agency to administer designation, revocation, and programs through an interagency committee.

The United States governments have proved "grossly ineffective" in drought response by utilizing crisis management rather than risk management. Coordination of drought planning between national and state level government is an imperative. "Most states have played a passive role, relying almost exclusively on the federal government to come to the assistance of residents of the drought-affected area," Wilhite declares (1987).

Chapter 2
Public Entity Organizational Learning

Many of the steps to drought planning focus on examining existing organizational policies and programs to identify needs and foster changes. To understand why these steps are so essential and vital to achieve, one must first understand the concept of organizational learning and the levels on which this learning may take place. Additionally, one must understand how these concepts specifically relate to public entities.

Barth (1996:45) defines organizational learning as that which "occurs when individuals, acting as learning agents, detect a match or mismatch of outcome to expectation which confirms or invalidates the organization's operating procedures or policies." These learning agents must embed or encode their information in the organization's memory so other individuals will subsequently act from it. If encoding fails to occur, individuals will have learned but the organization fails to do so. Often, encoding fails to occur. This stems from various systems that help or hinder acquisition and interpretation of knowledge in organizations. Without a learning climate, the organization hinders agents from encoding. Three basic steps that lead to the development learning climates in an organization are:

1. encourage individual learning
2. continually review and modify operations assumptions
3. include clients in the process (Richards, 1994).

If the open environment needed is suppressed, then decisions lack the specialized knowledge and experience the learning agent and the clients, in this case, the public offers (Barth, 1996).

Greg Richards (1994) gives five dimensions of organizational design factors that impact learning failure. First, **clarity of purpose**, recognizes that for an organization to succeed all its members must share a clear understanding of its objectives and how their work contributes to them. In the public sector the rapid rotation of senior policy officials makes setting a clear (and continuous) path difficult.

Second, the **leadership** of the organization needs to use a coaching, motiva-

tional approach to create an egalitarian climate. Managers must foster an open environment that allows for constructive criticisms though they may challenge the status quo.

Third, the organization must encourage **experimentation**. The organization's leaders must remove obstacles to innovation by setting broad policy guidelines for employees to work within.

Fourth, **transfer of knowledge**, allows a free flow of ideas within levels of the organizations. Richards (1994:7) points out that "bureaucracy sets up rules about who may communicate with whom; thus, information is often watered down or rendered incomprehensible." Information must flow quickly and accurately, cutting out the middle man whenever possible. Paperwork is discouraged while face-to-face meetings are encouraged.

Fifth, the organization must encourage **teamwork.** The teamwork concept generally goes against the bureaucratic model of agency and division rivalries. Organization leaders should facilitate development of group objectives and investigate ways to foster trust and interdependence between employees of all divisions at all levels (Richards, 1994).

It is possible to experience learning on a surface level. It is common for organizations to have a climate that encourages only lower level learning, such as "single-loop" learning. Single-loop learning means that errors are detected and corrected through organizational adjustment in a fixed context. A deeper level of learning, "double-loop" learning, challenges the organization to examine the basis of policies and programs. In other works, double-loop learning means the organization looks beyond the fixed context to examine underlying goals and objectives to see if they should be changed.

In essence, the single-loop learning process enables the organization to carry out its present policies to achieve its objectives. The double-loop learning process

occurs when policies and goals are questioned and altered (Barth, 1996).

Ventriss and Luke (1988) cite an illustrative example from Argyris (1978) to develop understanding of the distinction:

> In single-loop learning, for example you might debate what could be done to improve the profit picture in a nonprofitable division that was considered the president's pet project and hence not discussable. In double-loop learning, you could confront the problem head on and decide to discontinue the operation of the nonprofitable division (p. 31).

Another pair of learning concepts compares maintenance learning and innovative learning. Maintenance refers to the "acquisition of fixed outlooks, methods, and rules for dealing with known and recurring situations (Ventriss and Luke, 1988)." Innovative learning refers to "anticipating environments that have not yet developed and preparing for organizational action in new situations (Ventriss and Luke, 1988)." Innovative learning includes tackling emerging issues and issues without concrete, absolute solutions so that the organization reconfigures itself by replacing set procedures, improving information flows, and revitalizing its creative abilities. To simply remain effective, organizations must learn as fast as the surrounding changing environment but to practice innovative learning they must learn even faster and anticipate the future (Barth, 1996).

Ventriss and Luke (1988) provide six steps or modes to facilitate innovative learning. Since each component functions off the other, not one can be ignored. The six modes of innovative learning include:

1. examining and reinterpreting the organization's history and tradition in light of new and emerging markets
2. experimenting with new products and new organizational configurations
3. observing analogous or similar organizations and learning from their experience
4. engaging in a continuous process of analyzing trends in the external environment, identifying, and managing emerging issues
5. emphasizing training and education for organizational members
6. unlearning or discarding old strategies, norms, and processes that conflict with emerging changes in the external environment.

These two sets of learning concepts have generally been applied on an intra-

agency level. To understand how to bridge the preceding concepts into the interagency, consider the social learning component of learning theory which says that public organizations must learn to cope with interdependence between intergovernmental and intersectoral arenas. In social learning, organizations must embrace error, plan with the citizens and link knowledge to action. In a social learning organization program development follows a three-stage process: learning effectiveness, learning efficiency, and learning expansion.

Ventriss and Luke (1988) say government programs and policies should address locally defined needs within the unique socio-economic and political context in which local clients or aid-recipients live. This, however, requires government to open its policies to continual modification responding to changing local conditions instead of predetermined external "blueprint solutions." This need for flexibility is particularly acute with respect to drought since its conditions and effects can vary remarkably even within the same state. But the quick response required to answer changing local conditions takes the work of government on every level, including those represented.

To facilitate the structure needed for this response and to develop beyond the point of blueprint solutions, government needs to apply the concept of collaborative management to its actions. Collaborative management as applied to environmental management is a process that:

- ☑ broadens influence of all concerned with an environmental decision
- ☑ includes the needs and opinions of affected parties
- ☑ brings dialogue on normative values into the deliberative process
- ☑ results in decisions that enhance environmental protection (Bauer and Randolph, 1998).

It uses science, local knowledge and stakeholder values to attain its three major objectives: one, to resolve conflict, two, to develop a shared vision and three, to formulate creative solutions.

Since various parties in an environmental controversy bring different values, agendas, and strategies to the dispute, a given situation generally produces several

alternative solutions to the problem that reflect differing priorities such as economic development and environmental protection. Collaborative management ignores the typical, traditional approach that utilizes only technocratic, scientific or economic answers by giving all stakeholders in a given situation equal stature in the solution creation. Environmental solutions can't be limited to technical or scientific answers because these attempt to separate facts from values. But this means that politics and conflict become part of overall decision making process. Collaborative management encourages this participatory democracy which uses public dialogue to reach decisions.

Of the utilizable methods for achieving the objectives of this concept, collaborative discourse, partnerships and open discussion meetings have proved more effective than hearings and/or speeches. Part of the reason for this is the basic attitudes instilled by the meeting or input type. Typical public meetings, for instance, are based on premise "tell us what you think, and we, the public agency or arbitrator will decide" while the collaborative approach says "let us all discuss the matter, work through our differences, and decide together (Bauer and Randolph, 1998:2)."

Collaborative environmental management functions through four key, interlocking elements. If any element is de-emphasized, the effort is likely to fail. The four elements of collaborative environmental decision making are:

- ☑ early, extensive stakeholder involvement in planning, decision making, and implementation
- ☑ strong scientific information and analysis
- ☑ contextualized understanding of environmental problems and proactive efforts to resolve and prevent them
- ☑ integration of a wide range of creative solutions including flexible regulation, economic incentives and compensation, negotiated agreement, voluntary actions, and educational programs.

The process for collaborative environmental decision making is developed to fit the situation within two broad components. The first is a planning framework capable of the following:

- ☑ scoping the problem and the stakeholders
- ☑ gathering and analyzing scientific and other information
- ☑ formulating alternatives
- ☑ assessing effects of the alternatives
- ☑ evaluating and selecting an alternative.

The second component is stakeholder involvement featuring inclusive, open dialogue. Stakeholder involvement provides the key to the interlocking elements. Unsuccessful attempts at collaborative environmental management include those that undermine the process by excluding even a single stakeholder or by failing to give authority or responsibility to the stakeholder group. To succeed the process needs structure with a clear schedule, explicit milestone goals and use of small working groups of, at most, 15 people, in which a representative of each stakeholder group is a part.

Bauer and Randolph (1998) define six major steps to successful stakeholder involvement:

- ☑ identify all stakeholders and invite them to participate
- ☑ establish commitment and authority by giving authority for action and implementation responsibilities
- ☑ structure the process with an emphasis on stakeholder participation, expected milestones and deadlines, and with the larger group divided into subgroups of 10-15
- ☑ achieve trust among stakeholders
- ☑ share authority and roles between stakeholders (provide a neutral facilitator)
- ☑ engage in collaborative learning by:
  - ☐ stating issues, perceptions and values
  - ☐ identifying hidden agenda
  - ☐ developing shared values
  - ☐ restating the problem
  - ☐ seeking creative solutions.

Use of a method such as collaborative environmental management supports Barth's (1996) assertion that government needs to use a process perspective of the public interest that would first, consider the long-range view rather than excessively focus on the short-term, second, include input from the competing demands/ interests of all affected groups, and third, appreciate the thoughtful dissident along with supporters.

Utilization of such processes as collaborative environmental management would

find the government experiencing substantive learning, a learning concept that challenges public administrators to reflect upon the intended and unintended outcomes of policies in an intersectoral environment.

> Substantive learning (as applied to public affairs) involves the process of improving public action through knowledge that critically examines the domain assumptions and the normative implications of public policies in an interconnected political environment... Because public organizations are to protect some vision of the public interest, substantive learning challenges public administrators to critically reflect (and act) upon the intended and unintended substantive outcomes of enacted organizational policies in an intergovernmental and intersectoral environment (Ventriss and Luke, 1988, p.338).

Substantive learning features the following characteristics:

- ☑ It assumes that public organizations provide a larger mechanism for democratic policy decision making.
- ☑ It assumes that organizations exist in an environment of subtle and direct interconnections.
- ☑ It requires critical analysis of the outcomes of organizations.
- ☑ It focuses on social value and seeks critical, reflective awareness of individuals of the organization to identify unintended, indirect outcomes.
- ☑ It focuses on past, present and future policy choices to improve the human situation instead of developing procedure to enact policy (Ventriss and Luke, 1988).

The implementation process of substantive learning involves three major steps, first, problem posing, second, citizen and organization partnership in development of fresh approaches and third, citizen and organization partnership in evaluation of actions taken from new approaches. Ventriss and Mueller's 1985 work provides techniques for implementing substantive learning. First, design a participative service-delivery plan which delineates both citizen and administrator expectations of program responsibilities and evaluation. This should facilitate less dependence on professional services by fostering citizen learning while improving professionally codified knowledge. Second, initiate field-based learning labs to provide two-way information flow and serve as training centers for citizens. Third, incorporate a community learning advocacy program to work with citizens and governmental and non-governmental organizations to link information to program development to meet community

needs and examine past action approaches.

Of course, in the general course of government activity, often neither lower nor higher learning takes place. The public sector often falls prey to faulty organizational learning. Faulty organizational learning leads to "learning that does not improve an agency's performance (Ventriss and Luke, 1988)." In some cases, faulty learning can complicate an agency's reaction to a situation so that rather than improve upon previous actions it functions to further detriment.

In a related vein, organizational learning does not equate with organizational change. Ventriss and Luke cite B. Hedberg's "How Organizations Learn and Unlearn" which argues that learning is not synonymous with organizational adaptation. Learning is simply a process, while change is the outcome of the process. Learning does not automatically provide a precursor to change.

One reason for faulty learning and lack of change is that public bureaucracies generally adopt sub-optimal, rational, and wasteful patterns of behavior in decision making. What learning does occur happens in "stepwise, incremental, progression of small adjustments [that]... are moderated by intra-organizational conflicts and bureaucratic procedures (Ventriss and Luke, 1988:338)."

Chapter 3
Oklahoma's Drought Plan

Background of the drought plan

Though Oklahoma has only had a drought plan since 1996, the state has been active in the drought planning process for many years. During the years 1987 to 1989, Oklahoma participated with Pennsylvania, South Carolina, Kentucky, Montana, Colorado and Oregon to develop a model drought contingency plan for state governments (Wilhite, 1993; 1996). The project, directed by the International Drought Mitigation Center, was intended to improve state drought mitigation efforts through more timely and effective monitoring, assessment, and response activities.

The resulting plan includes Donald Wilhite's 10-step framework for drought planning, discussed at length in Chapter One. Participants generally agreed that drought planning must be guided by a group with sufficient authority and technical expertise to coordinate multi-agency involvement and perform (or authorize performance of) appropriate monitoring, response, and evaluation tasks. Additionally, any plan must be dynamic, or constantly revisited and updated.

Oklahoma's participation in this process emphasized the need for the state to have its own plan. The 1995 update of the 1980 Oklahoma Comprehensive Water Plan (OCWP) recommended the appointment of a state drought coordinator by the Governor. After the 1995-96 drought, state emergency officials and water resource planners recommended to the Governor that the state develop a comprehensive drought plan.

Governor Frank Keating took action on the numerous recommendations. In August 1996, the Governor issued Executive Order 96-24, creating the Oklahoma Drought Management Team (ODMT). Executive Order 96-24 provides the following duties for the Oklahoma Drought Management Team:

- ☑ provide organizational structure that assures information flow and defines duties and responsibilities of all agencies during drought emergencies
- ☑ provide probable impacts associated with periods of water shortage on primary economic and environmental sectors of the state
- ☑ develop and recommend state drought response, recovery and mitigation

initiatives for conditions determined to be detrimental to the state economy and public health

- ☑ identify drought management areas in the state
- ☑ provide coordination and communication among federal, state and local entities, as deemed appropriate for drought assistance programs, education and information
- ☑ perform other drought-related assessments and response function as deemed necessary.

ODMT's research found that the greatest impacts of drought are usually experienced in the agricultural community. This includes direct loss of crop and livestock production due to lack of surface and subsurface water and drought associated impacts such as increases in insect infestations, plant disease and wind erosion.

Oklahoma drought impacts include:

- ☑ reduced crop, rangeland, and forest productivity
- ☑ increased livestock and wildfire mortality rates
- ☑ reduced income for farmers and agribusiness
- ☑ increased fire hazard
- ☑ reduced water supplies for municipal/industrial, agricultural and power uses
- ☑ damage to fish and wildlife habitat
- ☑ increased consumer prices for food and timber
- ☑ reduced tourism and recreational activities
- ☑ unemployment
- ☑ reduced tax revenues because of reduced expenditures
- ☑ foreclosures on bank loans to farmers and businesses.

The state's most vulnerable agricultural commodity in a drought is wheat, Oklahoma's second largest cash crop. The 1996 wheat crop was barely one half of normal and the smallest in 25 years. That year, bankruptcies and foreclosures increased substantially (Oklahoma Drought Management Team, 1997). During drought, the ripple effect of reduced farming income extends to retailers and others who provide goods and services to farmers, leading to unemployment, increased credit risk for financial institutions, capital shortfalls and loss of tax revenue for local, state and federal government.

Indeed, economic damage and agricultural damage go hand in hand during

drought. In 1996, soil/wind erosion resulting from drought damaged 700,000 acres in Oklahoma's 30 western counties as compared to 42,000 acres the year previous (a non-drought year). Also, in 1996 drought induced wildfires destroyed 420,000 acres of grazing pastures and range land worth $10 million, 2,000 miles of fence worth $6 million, and uninsured hay, corrals and other farm structures worth $3.2 million. Fires destroyed 280,000 acres of forest and woodland during a three-month period. The wildfire suppression costs topped out at $6.5 million. The then newly formed drought management team deemed the 1995-96 drought one of the most severe on record. It reassured Oklahomans though, that it would take several years of continuing drought conditions for Oklahoma to again experience the "monumentally damaging climatic conditions" that occurred during the 1933-37 Dust Bowl.

The Oklahoma Drought Management Plan, prepared by the Oklahoma Drought Management Team, outlines the mitigation process for drought in Oklahoma. It provides, in generalized terms how the government will respond when a drought event occurs. The authors of the Oklahoma Drought Contingency Plan describe previous state and local response to drought episodes as crisis management, and admit the ineffectiveness of stopgap measures in mitigating both the short- and long-term impacts of drought.

In a letter of promulgation of August 1997, the Governor directs "the head of each designated department and agency to take the necessary actions to implement it (the drought management plan) by developing written internal procedures that detail support required by the plan and being prepared to put the plan into action." The Governor designated the Director of the Department of Civil Emergency Management as the official responsible for assisting him in coordinating State operations.

Prepared as part of Oklahoma's Emergency Preparedness Planning effort, the drought contingency plan delineates appropriate response actions for districts,

cities, counties, state agencies and the federal government. It suggests primary lines of authority and responsibility, and details the request procedures for state and/or federal assistance. The ODMT recommends utilization of the plan in conjunction with the State Emergency Operations Plan.

The state drought plan's general response mechanism states that drought response normally progresses from the individual to the closest level of government. Only when the response capability of each level has been exhausted or exceeded should the next level of response be pursued. Lateral assistance and exchange of information occurs at the individual/city/district, county and/or state level. During drought emergencies, parallel lines of communication are established between individuals and local governmental and other drought response occurs through:

- ☑ USDA county and state emergency boards
- ☑ state agencies and their district, local or field offices
- ☑ local emergency management organizations and the State Department of Emergency Management.

In addition to communications pathways and request procedures, the plan outlines the phased approach Oklahoma's response effort should follow as water conditions deteriorate. The four phases, in order, are: advisory, alert, warning, and emergency. Thresholds have been established so each phase triggers predefined actions in appropriate agencies and organizations.

The plan uses a combination of indices and related factors to determine what phase to trigger. The indices/factors used by the ODMT to determine progressive drought stages are:

- ☒ Crop Moisture Index
- ☒ Keetch-Byram Drought Index
- ☒ Major/Minor Reservoir Storage and Public Water Supply
- ☒ Palmer Drought Severity Index
- ☒ Precipitation
- ☒ Reclamation Drought Index
- ☒ Standardized Precipitation Index
- ☒ Streamflows
- ☒ Water Well Levels.

The ODMT has also been considering computer models of river and reservoir systems, such as the hydrologic and reservoir simulation models in use by the Bureau of Reclamation and Army Corps of Engineers.

Analysis of the drought plan

Oklahoma's phased drought plan approach works well for drought by itself, a creeping natural hazard with long-term effects. Response actions such as the hay lift used in 1998 function well in this approach. On the other hand, drought also brings acute sub-impacts such as wildfires. Mitigation of these sub-impacts requires quick mobilization of resources and instantaneous communications.

The body of the plan refers to mitigatory actions agencies can take related to the creeping effects of drought. The majority of these include mitigation of impacts to the agricultural community and ways to provide drinking water to those in need. The plan includes a few vague references to acute mitigatory actions. One of these lies within the paragraph on rural fire protection departments. It states "Oklahoma's rural fire protection districts (RFPD) are responsible for providing fire protection for members." The remainder of the paragraph refers to actions the RFPDs may take in relation to providing water to other entities and tracking water needs. Later, the plan states that the Oklahoma Department of Agriculture "may take into account the effect of the drought upon fire hazard and suppression." These two short sentences provide the majority of the mitigatory actions offered in the plan for mitigating wildfire. The plan broadly and indirectly refers to acute response twice in the plan. In reference to the Oklahoma Department of Emergency Management, the plan states it "implements and coordinates the development of programs and plans to minimize the effects of disasters and emergency situations." Although this statement does not specifically name fire it can certainly be included in any consideration of disasters and emergency situations. The plan similarly glosses over the mitigatory actions the Federal Emergency Management

Agency can provide. The plan's discussion of this agency focuses on its ability to process requests for Presidential Emergency and Major Disaster Declarations. It briefly mentions that FEMA "provides assistance to states, local entities and ordinances in response to various natural disasters." The plan does not offer RFPDs a higher agency to turn to for funding, fire-fighting assistance, additional staff or equipment. By leaving out these options it assumes RFPDs already know where to turn.

Another important acute situation the plan largely overlooks is the need for a comprehensive water rationing plan that is implemented equally throughout any area suffering drought. Currently, cities and towns implement their own plans willy-nilly. Two adjacent towns, receiving water from the same source may implement entirely different rationing plans. While one town rations its use severely the neighboring town may choose to continue its use at the same or higher level. This puts increased pressure on an increasingly valuable source - water. Looking historically at the 1996 and 1998 droughts, one sees that few towns implemented the same level of rationing at the same time.

The argument that one town uses a different source for its water than its neighbor is mute during a drought. Ultimately, the environmentalists argument that all things are connected applies here. The need for water conservation during a drought is paramount. What is conserved in an area suffering from moderate drought can and should be shared with an area suffering from severe drought. The state should author a strong, phased water rationing plan that begins its implementation in the earliest stage of drought and continues to limit use as the drought worsens. Even in the earliest stage, the plan should avoid the temptation to use voluntary rationing as it does not work (see Chapter 4). Finally, this plan must include penalties for violation that are enforced from day one of implementation.

The plan hopes to accomplish a comprehensive approach to mitigation, as evidenced by their creation of the committees Wilhite suggested. But, they gave these committees no real mitigatory power and too vague duties. What the state ends up with is a list of agencies and a limited discussion of what they might be able to provide, or in other words, a programmatic response to a comprehensive problem. What the plan doesn't provide is a simple, well-organized approach to mitigation that offers each of the communities affected by drought a comprehensive guide to how to mitigate a drought, which is what a drought plan is supposed to be. Illustrations 3.1 and 3.2 detail the information flows used in the 1996 and 1998 droughts in the mitigation of agricultural and wildfire, respectively. The illustrations show the complexity of communications in both areas of mitigation. Rather than an organized stream, infomation flows in a haphazard manner.

Because the drought plan offers no specific hierarchy of mitigation actions, it actually hinders the state's response. It uses prescriptive recommendations not based on established patterns of mitigation or the input of experienced users. The drought plan offers the following theoretical collaborations:

- ☒ ODCEM coordinates water supply operations with emergency management at the federal level.
- ☒ The governor coordinates with the President on emergency or major disaster declarations.
- ☒ The USDA Emergency Board at the state level coordinates all disaster activities and programs of USDA agencies.
- ☒ The U.S. Army Corps of Engineers may coordinate with non-specified agencies/individuals in the preparation of drought contingency plans.
- ☒ U.S. Department of Health and Human Services may collaborate with state health officials on health related problems caused by drought and/or

may provide technical engineering assistance in assessing health problems.

☒ The Natural Resources Conservation Service may coordinate with local governments and conservation districts to provide farmers and ranchers with technical assistance; coordinate with local organizations on technical and financial assistance for small watershed projects; may coordinate with local agencies in collecting decision-making information and developing plans.

The actions taken during mitigation of the two droughts differ radically from those the plan suggests. This illustrates two important points: first, that the plan's creators used theory rather than experience in its crafting and second, that agencies did not follow the plan in 1998. The following local-state-federal collaborative actions were taken in the 1995-96 and 1998 droughts:

☒ The Federal Emergency Management Agency (FEMA) collaborated with fire fighters in the Perry, Stillwater, Perkins fire complex through a fire suppression grant; FEMA collaborated with local fire fighters by sending an Incident Command Team (personnel and equipment) to assist in fire suppression; collaborated with multiple states in creating a drought task force.

☒ The American Red Cross collaborated with the First Baptist Church in Bristow to create a shelter for fire victims.

☒ The Civil Air Patrol collaborated with local fire fighters.

☒ The U.S. Forest Service collaborated with the state of Oklahoma by providing equipment and personnel to fight fires after the state activated the South-Central Forest Fire Protection Compact.

☒ The Oklahoma National Guard collaborated with local fire fighters by providing helicopter support in the battling of the Sperry-Skiatook-Barnsdall complex.

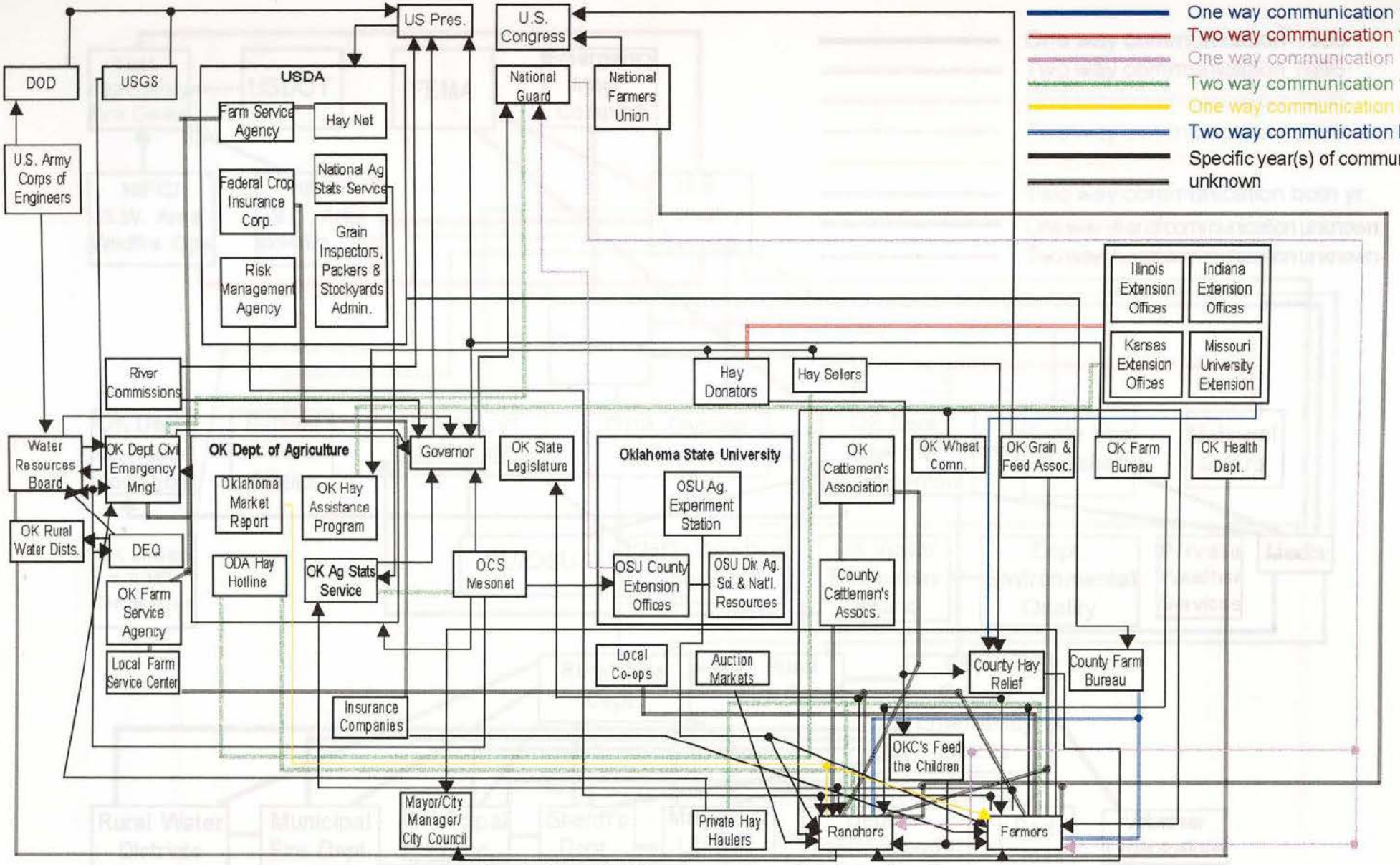


Illustration 3.1 - Inter-agency Drought Information Flows

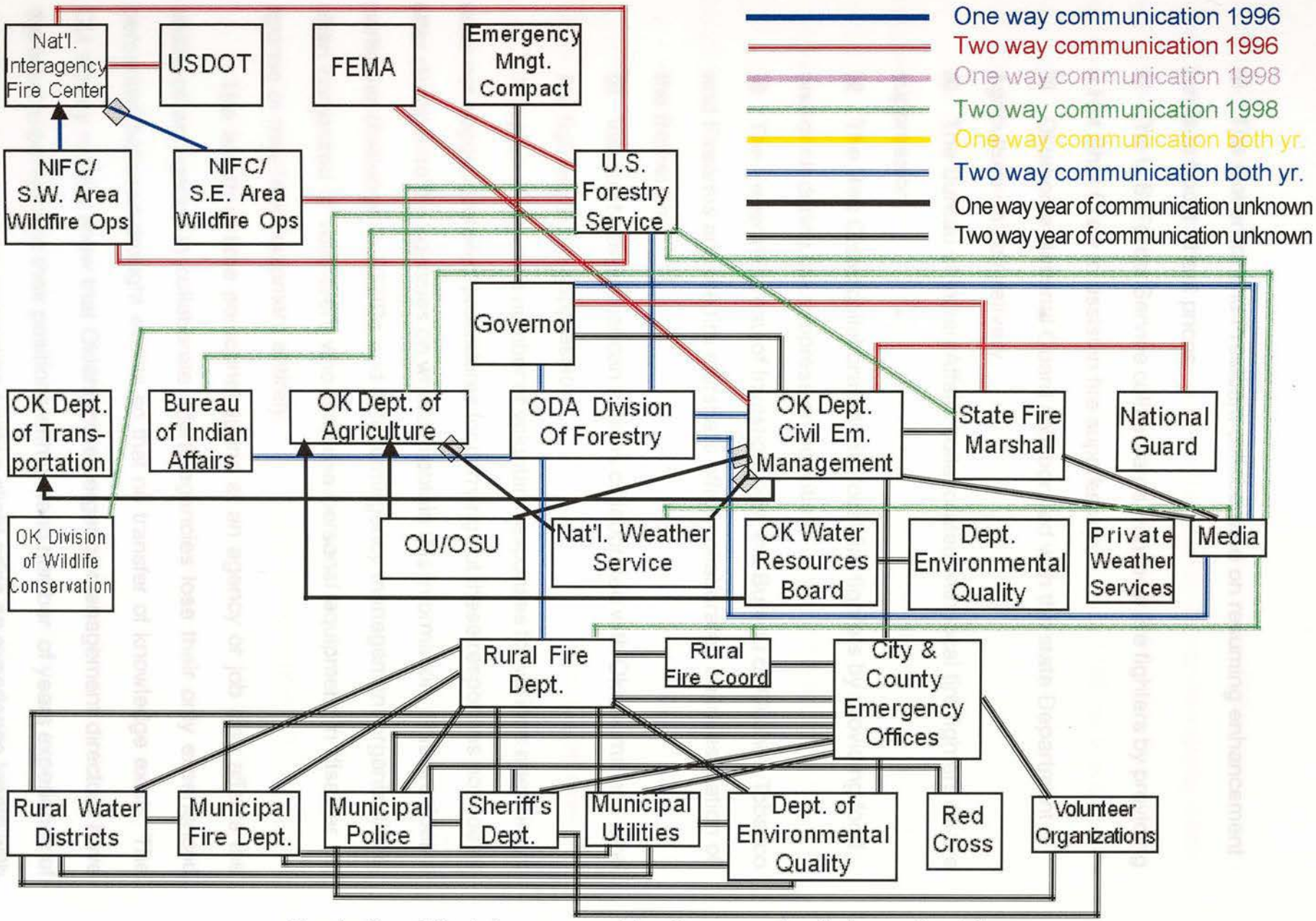


Illustration 3.2 - Inter-agency Fire Suppression Information Flows

☒ The Governor and President collaborated on resuming enhancement funds to boost wheat prices.

☒ The U.S. Forest Service collaborated with local fire fighters by providing a Hot Shot Crew to assist in fire suppression.

☒ Oklahoma National Guard collaborated with the state Department of Agriculture on hay delivery.

☒ The Bureau of Indian Affairs collaborated with local fire fighters on fire suppression.

☒ The Red Cross collaborated with local fire fighters by providing food and drink during fire suppression activities.

☒ The Federal Bureau of Investigations, the Bureau of Alcohol, Tobacco and Firearms and the fire marshal's office collaborated on investigation of the Bethel fire.

☒ Various Native American nations collaborated with Oklahoma and local fire fighters in fire suppression.

The plan suggests a number of voluntary responses for various agencies. It does not suggest detailed procedures for carrying out these responses nor does it offer direction to the agencies on where to obtain this information. This provides a particular challenge to RFPDs and local emergency management organizations, often composed of volunteers who may use personal equipment in disaster response or may lack equipment entirely.

The length of time personnel spend at an agency or job also affects the ability of an agency to collaborate. Many agencies lose their only experienced personnel between drought events so that no transfer of knowledge exists. The OU survey results show that Oklahoma emergency management directors have the least experience in their positions with a mean number of years experience of 6.8 years. Agriculture personnel had only a slight edge on experience length with

a mean length of experience of 6.805 years. The surveys show wildfire users have a little more than two years more experience than agriculture or emergency management respondents with a mean length of 8.94 years in the field. This means that many of the personnel participating in mitigation of the 1995-96 drought did not have previous experience with drought mitigation in Oklahoma because the state's last major drought previous to that was in 1980s.

The drought plan needs to provide specific detail regarding each collaborative action it suggests. It needs to provide information such as the position or division of an agency that one would contact, the specific action(s) possible, the exact procedure(s) for requesting or filing for these including a detailed description of the information needed to make the request, and an expected response timeline.

Implementing the plan

The drought management team began meeting in September of 1996. As per Wilhite's drought planning framework, the ODMT formed three committees: the Water Availability and Outlook Committee (WAOC) and the Impact Assessment and Response Committee (IARC), and the Interagency Coordinating Committee (ICC). The latter, comprised of WAOC and IARC representatives, assumes the overall drought response role, including intergovernmental coordination and media relations, throughout the emergency phase. Subsequent meetings focused on the current drought-related capabilities of respective members.

The drought plan defines the duties and responsibilities of the drought management team, each of its committees and drought coordinator. The ODMT makes the official determination in activating a specified drought stage in a particular climate division or region.

The drought coordinator's (DC) duties include briefing the governor, requesting specific actions requiring authorization of the state's executive branch, convening the drought team or its committees, individual meetings with committee

chairs or individual members and, requesting informal assistance and advice from individual weather, climate and water resource representatives of the drought team in an advisory phase. The DC also activates and meets with the WAOC and IARC and directs and coordinates the activities of the ICC. The coordinator reviews available information for deteriorating moisture conditions and the likelihood for drought emergency and requests that the governor (on behalf of the state) pursue formal drought mitigation assistance or use other extraordinary powers or options allowed through state of emergency declaration, if proclaimed.

The WAOC's duties intertwine with the coordinator's as it is this committee that keeps the coordinator continuously apprised of water/moisture contingency conditions before and after drought episodes. It also develops and maintains the monitoring mechanism of hydrologic and weather views and monitors current water availability and moisture conditions and provides estimates of near future water supplies for agricultural, municipal, industrial and power uses. The committee prepares for the Governor's signature the "memorandum of Potential Drought Emergency" that activates IARC in warning phase.

The WAOC corresponds via an informal communications medium such as e-mail and meets informally on a monthly basis. During an alert phase however, the committee convenes formal monthly meetings to assess drought trends and projections. It reports all findings from monthly meetings to the DC and drought team and informs the media through the Oklahoma Water Resources Bulletin.

While the WOAC oversees the water availability, the IARC has continuous oversight of drought impacts on various economic, environmental and social sectors and initiates appropriate drought response within the capabilities of the drought management team. It also assesses and identifies specific needs that cannot be addressed through existing state channels.

The IARC defines drought impacts, then develops policy-related aspects of

drought response. It informs the DC and ODMT members of the state's current drought impact situation and provides associated recommendations and prepares the state drought emergency proclamation for the Governor's signature in an Emergency phase.

The Governor's proclamation activates the Interagency Coordinating Committee. Once the ICC has been activated, the IARC transfers the drought response and coordination role of the drought team to the ICC. The drought coordinator selects the members of the Interagency Coordinating Committee, which consists of senior managers of lead drought response agencies in the state government. The drought coordinator also chairs the ICC.

Meanwhile the Interagency Coordinating Committee determines which drought-related needs of the state can be met by reallocation of existing resources and makes the appropriate recommendations to DC and Governor.

This committee assembles supporting data on behalf of the Governor for preparation of a request proclamation for a presidential drought/disaster declaration. Finally, when the drought ends the IARC prepares the end to the drought emergency proclamation and the final report of emergency phase activities. It then disbands until the next drought.

In addition to the duties of the drought team, the plan outlines specific responses possible for many agencies at the local, state and national level but in most cases does not require action. Throughout the document the authors use "wiggle words" (Loving, 1995) such as "may" or "should" rather than empowering words such as "shall" or "will," which would lend strength and regulatory credence to a document.

Local Level Actions

At the local level, the plan addresses seven broad categories of entities and their possible response actions.

County governments

County governments, through emergency management organizations, typically form the first line of response. They function as assessors, planners, and providers. Their possible response actions include initiating and conducting emergency water supply operations, including accepting water requests, providing storage, treating the water for human consumption, and providing security for water transportation equipment/water supply. The county may request assistance from the state in conducting emergency water supply operations and obtain equipment, supplies or services from private individuals, commercial or industrial firms, volunteer emergency organizations, or state or federal government (through the Oklahoma Department of Emergency Management). In addition, county governments assist the USDA emergency board in equitable distribution of available livestock water supplies.

The county government may also assess ongoing drought conditions throughout the county focusing on water supplies, and analyze future impact of drought on water supplies and system. It then provides the future water supply and system analysis to the Oklahoma Drought Management Team.

The county commissioner (CC) requests, by letter, that the Governor declare a "drought emergency" in the county "due to severe and continuing drought" and that the Governor take action. This request includes a detailed report of drought conditions. The CC forwards copies of the emergency declaration request to the ODMT and Department of Agriculture. The county can request that the Governor forward the drought emergency request to the Secretary of Agriculture.

Individuals and Private Industry

The suggestions for individuals and private industry are few in number though this mitigation level includes some of the actions that most greatly affect the success of a government's mitigation efforts, such as participation in voluntary/man-

datory water rationing programs. Possible response actions by individuals and private industry include providing equipment, vehicles, and/or specialized skills or expertise through lease, sale, other compensation, or donation.

Irrigation Districts

The specific responsibilities/possible response actions for irrigation districts include everyday actions such as supplying water to members and non-members. Irrigation districts are also told to maximize use of available supplies consistent with the member's current allocated water rights and encourage or enforce agricultural water conservation practices. The plan informs them that they may request emergency water though the local watermaster's office.

After addressing those obvious actions the plan directs irrigation districts to develop drought plans and forward drought plans to the appropriate local emergency management organization and USDA county emergency board but includes no instructions on how to go about this.

Rural Fire Protection Departments

The plan tells rural fire protection departments to provide fire protection for members and utilize equipment for transporting emergency water. The plan further directs these fire departments to prepare an estimate of the impact the drought and associated decreases in water would have on fire protection capabilities but, again, offers no tutorials or formatting for this assignment. The departments should then provide the estimate to the local USDA county emergency board.

Rural Water Districts and Municipalities

The first instruction the drought plan gives to water districts is to provide water protection for domestic and municipal use of members or residents and to allocate existing water supplies in a manner that maximizes benefits to all users. The plan suggests the districts encourage or enforce water conservation practices and restrict or curtail secondary uses of water. Rural areas may obtain assistance

with water curtailment plans and water conservation practices from the Oklahoma Department of Environment Quality and Water Resources Board.

They may also provide and distribute emergency water supplies to users and, when authorized, provide emergency water to other cities or districts or users outside the district. If needed, the districts may request additional water rights from the local watermaster's office and request assistance in providing emergency water through county emergency management organizations except when the district lies within a city. In this case, the request should be made through the city's emergency management organization.

Finally, each district or municipality should develop a contingency plan to address future supply problems and provide the contingency plan to the county emergency management organization. Again, the plan provides no instructions or assistance for this developmental task. The plan needs a much more detailed focus on rural water districts and municipalities because rural communities are especially vulnerable to drought. As the plan's authors point out in explaining primary drought impacts, drought has a much greater impact on municipal lakes that rely on small watersheds. These small watersheds experience significant fluctuations during droughts and heat waves.

USDA Emergency Boards (County)

The county level emergency boards generally act as liaison with county government. They coordinate programs of the Farm Service Agency, Extension Service, Natural Resources Conservation Service, and Rural Development, process assistance requests and develop Natural Disaster Damage Assessment Reports (NDDAR). The county boards then submit NDDARs to the State Emergency Board.

Volunteer Relief Organizations

After concluding the actions local/county level organizations may take, the plan states that volunteer relief organizations may provide personnel to distribute

emergency drinking water to the aged, handicapped and others unable to transport water from a distribution point and/or hold mass feedings for drought victims when drought conditions prohibit or restrict normal individual preparation and/or delivery of food. VROs may also provide personnel to serve at distribution points for emergency water supplies or provide shelter of victims evacuated from drought stricken areas.

State Level Actions

At the state level, the plan addresses sixteen entities or categories of organization and their possible response actions. The "General" and "Governor" categories are not actually sections in the plan but the responsibilities were culled from throughout the plan's text when they were mentioned in conjunction with another agency's duties. The Oklahoma Rural Water Association and Oklahoma Municipal League categories are combined as a generic category, Other State Drought Assistance, in the state's plan.

Department of Agriculture

The Oklahoma Department of Agriculture may assist the agricultural community in assessing and responding to drought impacts, assist the Oklahoma State University Agricultural Extension Service in providing estimates of the impact to state forest lands and agriculture and provide statistics on the effects of drought on farming and ranching. ODA should develop and implement plans to limit forest land access. The Department provides information on the ability of private sector equipment for transporting or storing emergency water supplies. It may also transport non-potable emergency water supplies.

The agency should work with Oklahoma Department of Emergency Management to obtain federal agricultural-related assistance and submit recommendations concerning county emergency declaration requests to the Water Availability and Outlook Committee. It also chairs the Impact Assessment and Response

Committee of the Oklahoma Drought Management Team.

Department of Central Services

The Department of Central Services may authorize state agencies to make purchases without following competitive bidding procedures and may purchase supplies or equipment on behalf of state agencies. It provides information on emergency water supply equipment available through the private sector.

Oklahoma Climatological Survey

The plan states the obvious mission of an agency rather than suggesting mitigatory responses. The plan suggests that the Oklahoma Climatological Survey (OCS) accumulate and disseminate statewide climatological data and serve as the data collection and dissemination center for the Oklahoma Mesonet. The plan also states the OCS may maintain an archive of statewide precipitation and temperature data and maintain the Oklahoma Fire Danger Model. These actions have been performed by the Survey for some years without direction from the drought plan.

Finally, the plan directs the OCS to determine state policy regarding climate-related issues, though without legislatorial power, it is hard to understand how the plan's authors intended for these policies to see implementation. The plan does not provide a liaison relationship with the state legislature or the governor, leaving the survey in an advisory position.

Department of Commerce

The plan suggests that the Department of Commerce promote economic development. It states the DC may administer federal funds for planning assistance to state agencies, sub-state planning districts and local communities. Other mitigation alternatives it may take include providing estimates on projected loss of jobs due to drought, providing information to business and industry on federal loan programs available due to a disaster and on water conservation.

Conservation Commission

The Conservation Commission's possible response actions include developing and administering programs to control and prevent soil erosion, prevent floodwater and sediment damage, reduce non-point source pollution, protect wetlands, promote conservation, and development and utilization of the state's renewable resources. The commission should provide feedback from 88 conservation districts on drought conditions and monitor water supply pool conditions of upstream flood control projects under its jurisdiction.

Corporation Commission

The Corporation Commission may provide estimates of the impact of ongoing drought on generation of electric power and advises the Governor on reduction needs in allocation of the state's electric power. The commission also provides information on the availability of private sector equipment for transporting or storing emergency water supplies.

Department of Civil Emergency Management

Oklahoma Department of Civil Emergency Management coordinates emergency water supply operations of state departments and agencies and water supply assistance from federal or private resources not otherwise addressed in local emergency plans. ODCEM implements and coordinates the development of programs and plans to minimize the effects of disasters and emergency situations and coordinates estimates of drought impact and provides information on emergency water supply equipment available through the private sector.

The department also acts as liaison between the emergency management at the local, state and federal levels by handling requests from local governments and districts for emergency water assistance, coordinating direct emergency assistance from state agencies relative to pumping of water and providing administrative and coordination services related to a federal major disaster or emergency.

It also coordinates emergency water supply assistance from federal or private sources not addressed in local emergency plans.

ODCEM acts as a liaison to the Governor's office as well. In this capacity the department advises the Governor of the need for a Governor's declaration of state/regional emergency or federal assistance or disaster declarations and drafts the Governor's requests for Presidential "Emergency" or "Major Disaster" declarations.

Department of Environmental Quality

The Department of Environmental Quality monitors the drought situation. It provides estimates of the impact of the drought on water quality and issues regular water system/supply status reports during drought.

DEQ interacts with public/community water systems, in part by regularly publishing the "Drought Status Report." DEQ also maintains fact sheets and news releases on water conservation and related programs as another method of keeping the general public informed.

Department of Health

The Department of Health's actions relate primarily to drinking water. It may provide lists of bottled water facilities and ice manufacturers to support public water supplies and certify bottled water for human consumption. The department also releases medical warnings regarding health effects associated with drought conditions.

Military Department

The plan suggests the military could provide emergency water treatment and provide transportation of water through tank trucks, trailers or other vehicles. In the drought of 1998 though, its talents were instead used for transporting hay when Governor Keating activated the National Guard.

Oklahoma State University Cooperative Extension Service

OSU's Cooperative Extension Service may prepare information on agricultural drought management practices, agricultural and domestic water conservation practices, and supplies management practices for the public. The plan's authors also suggest that the Extension Service take part in impact assessment. It is the service's duty to provide (through the state level USDA Emergency Board) estimates of drought impact on state agriculture. Finally, it should function as a clearing house for information on federal assistance for agricultural drought victims.

Department of Tourism and Recreation

The tourism agency's only duty is to provide information on the economic and social impacts of drought on state parks, recreation areas and lodges.

USDA Emergency Board (State)

The plan suggests State level USDA emergency boards coordinate the disaster activities and programs of USDA agencies. This includes requesting, editing and distributing Natural Disaster Assessment Reports from the County Emergency Boards. These boards report on drought conditions and anticipated agricultural impacts, functions as a liaison with state government by informing the Governor, ODCEM, ODAG, Drought Management Team of activities and reports.

Water Resources Board

The Water Resources Board administers surface and groundwater rights in Oklahoma and chairs the Water Availability and Outlook Committee. During a drought, its direct mitigation actions include monitoring groundwater levels, requiring junior water rights holders to curtail use to satisfy the needs of senior downstream users, expediting issuance of water rights requested for emergency water supply purposes, and directing the Oklahoma Weather Modification Program to augment rainfall and reduce state hail damage. It also provides information on state-licensed water well drillers.

The Board assists users in analyzing future water supply situation and identifying alternate water sources and conservation options. It administers two loan/grant programs, the State Financial Assistance Program that provides loans/grants for water/wastewater facility improvements and the Oklahoma Leak Detection Program that provides loans/grants to identify and repair rural water system leaks.

Finally, the WRB provides situation analysis by estimating the effects of drought on groundwater and related water users. It publishes this and other drought related information in the *Oklahoma Water Resources Bulletin*, initiated during the 1995-96 drought to keep the governor's office, media, state legislature and state and federal agencies appraised of the situation. It is published seasonally during winter or monthly during normal conditions, every two weeks during advisory or alert phases, weekly during warning or emergency phases (as determined by DC and DMT).

Department of Wildlife Conservation

In a drought, the Department of Wildlife Conservation may provide estimates of the impact of drought on fish and wildlife resources and recommend actions related to maintenance of instream flows for fish protection. It may also, adjust fishing and hunting regulations to compensate for drought conditions. DWC may develop and implement alternative procedures for providing food and water for wildlife. The plan provides no suggested structure, development clues, or deadlines for this task. Finally, the only duty the plan lists for the department that is unrelated to wildlife is to provide tank trucks, trailers, or other vehicles capable of transporting or storing emergency water.

Oklahoma Rural Water Association

The Oklahoma Rural Water Association cooperates with the OWRB in administering the Oklahoma Leak Detection Program. It also provides technical assistance related to capacity, treatment, and distribution problems of 1,000 small

water supply systems.

Oklahoma Municipal League

The mitigation duties of the Oklahoma Municipal League consist of impact reporting and maintaining a referral service. OML provides information on current impacts experienced by Oklahoma's municipalities and provides referrals to community systems in need of assistance from other agencies and organizations.

Governor

The governor directs and controls distribution of water supplies under drought emergency conditions. He/she declares a drought emergency in counties experiencing "severe and continuing drought" and coordinates State drought related operations. When local and state resources are inadequate, the governor requests federal assistance. Finally, the Governor activates the Impact Assessment and Response Committee under recommendation from the drought coordinator and the Water Availability and Outlook Committee members in the Warning Phase and requests USDA Emergency Board assistance.

General

As previously mentioned, some mitigatory actions were mined from outside the pre-set categories provided in the state drought plan. The first of these is that state government departments and agencies capable of providing emergency water supply assistance will do so when directed by the Governor or his authorized representatives.

The second, is that the Water Availability and Outlook Committee forwards to the Governor the Oklahoma Drought Management Team and Oklahoma Department of Agriculture recommendations concerning county drought emergency declarations.

Federal Level Actions

At the federal level the plan addresses eighteen organizations and their

possible response actions. The President's section is not actually a section in the plan but the responsibilities were culled from throughout the plan's text when mentioned in conjunction with another agency's duties.

U.S. Department of Agriculture

The plan states that the U.S. Department of Agriculture may provide feed, including hay, on a cost-sharing basis through the Emergency Feed Program. Unfortunately, that program was discontinued by the 1996 Freedom to Farm law. The plan also suggests the USDA distribute its publication "Natural Disaster Assistance Available from the USDA" which details the agency's assistance programs.

The plan does not outline or even mention these programs though to qualify for many of them, a variety of inter-agency interactions must take place. For instance, before the USDA can offer farmers participation in its low-interest emergency loan program or conservation assistance, the U.S. Agriculture Secretary must declare the counties in question federal disaster areas. Since the premise of the drought plan was to outline the possible actions of each agency at every level, the plan needs a much more detailed treatment of the USDA, the most turned to agency regarding the agricultural aspects of drought.

American Red Cross

Broadly, the American Red Cross may cooperate with general community-based response efforts to reduce human suffering or meet basic needs. More specifically, it may establish and staff first-aid stations at community sites designated for distribution of water and provide voluntary personnel to assist local government response actions. The agency may also provide technical consultation and guidance to local and state government agencies in planning for the distribution of water from central sites and coordinate voluntary agency activities designed to support local community response efforts.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers may provide guidance in the preparation of drought contingency plans. It may also provide technical assistance and guidance on specific water and related land resource problems.

The Corps should provide daily information on the 25 major reservoirs under its jurisdiction and water once a state drought emergency has been declared. It should also pay for transportation costs of water used for human and livestock consumption and for the installation of water supply wells. (Repayment to the federal government is required).

Bureau of Indians Affairs

The plan designates two duties to the Bureau of Indian Affairs. It should represent Native American water rights and coordinate various environmental programs on tribal lands.

Bureau of Reclamation

The plan suggests that the Bureau of Reclamation assist in development of and conservation of water, power and related land resources and participate in cooperative programs with local and state entities related to water conservation and drought planning. Additionally, the Bureau should provide water level information on seven major Bureau-constructed lakes in Oklahoma (from local operators).

Department of Defense

The Department of Defense may transport water or drill wells (for human and livestock consumption) for political subdivisions using federal equipment and laborers.

Federal Emergency Management Agency

Interestingly, the plan largely ignores the Federal Emergency Management Agency, the federal agency created to deal with natural and man-made disasters. The plan lists only one mitigation action for it - to process requests by the Governor

for Presidential "Emergency" and "Major Disaster" declarations.

Farm Service Agency

Generally, the Farm Service Agency should evaluate agricultural losses and assist in preventing wind erosion damage to farmland. The agency administers the Non-insured Crop Disaster Assistance Program. To mitigate drought it may also provide cost-sharing funds to develop water supplies for grazing livestock through its Emergency Conservation Program and allow grazing and haying of Conservation Reserve Program lands.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service should assist states in planning and developing projects to restore and manage fish and wildlife resources. The Service also monitors impacts to instream flows, endangered species, waterfowl and/or effects on federal wildlife refuges.

U.S. Geological Survey

The U.S. Geological Survey provides hydrologic information, appraises water resources and interprets hydrologic data for use by individuals in the public and private sectors. This includes computerized historic data for more than 25,000 sites in Oklahoma. It also provides water information for economic development and best use of water resources. From the direct mitigation standpoint, the Survey maintains 155 river stage/discharge and lake stage sites.

U.S. Department of Health and Human Services

The Department of Health and Human Services may assist state health officials and other federal officials with (drought) health-related problems and provide advice, guidance and technical engineering assistance in assessing actual or potential health problems and provision of medical care through regional or state offices.

It may provide various financial assistance programs and other human ser-

vice programs through the state or district office of the Social Security Administration. Additionally, it may assume a portion or all costs associated with developing projects to relieve older individuals of burdens of costly utility service.

Internal Revenue Service

The Internal Revenue Service permits farmers or ranchers who involuntarily sell more animals than normal to postpone reporting the excess income until the following year.

Natural Resources Conservation Service

The drought plan suggests the Natural Resources Conservation Service provide technical assistance through local conservation districts to farmers, ranchers and local governments. Related to this, the NRCS may provide technical and financial assistance to local organizations for planning and implementing small watershed projects for watershed protection, flood prevention, agricultural water management, recreation, municipal and industrial water supply, and fish and wildlife development. It may also assist state and local agencies in collecting decision-making information and developing plans of action regarding water and related land resources through the River Basin Surveys and Investigations Program. The Service should conserve and develop the soil and water of the Great Plains area by providing technical and financial assistance to farmers, ranchers and others through the Great Plains Conservation Program.

The NRCS also provides analysis. It compiles reports on short-duration natural phenomena and provides field collection, interpretation and publication of natural and related resource data to government agencies, individuals and organizations.

Rural Development

The mitigation possibilities for Rural Development (previously known as Farmers Home Administration) focus on loan programs. The organization may loan

farmers funds to establish wells through the Emergency, Soil and Water, Farm Ownership, Watershed and Operating loan programs. It may also make emergency loans in counties where natural disaster results in physical property damages and/ or severe production losses to farming, ranching or aquaculture operations.

In addition to aiding agricultural producers, it may make loans to governmental bodies to alleviate water shortages in rural areas.

Small Business Administration

The mitigation opportunities for the Small Business Administration also focus on loans. It may offer Economic Injury Disaster Loans to small business and agricultural cooperatives dependent on farmers and ranchers as customers.

National Weather Service

The National Weather Service can offer significant analytical information. It may provide information on current weather and river stages and weather forecasts prepared locally in various time spans, from five day- through long-term-forecasts. It can provide outlook forecasts for six to 10 day, 30 day, 60 day, and 90 day periods.

U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development may provide Community Development Block Grants to cities or communities for projects such as construction or repair of water lines, new water wells, and other related construction that would meet existing community needs. It may also waive program requirements so funds may be redirected to emergency situations if requested when a Presidential declaration of disaster is in place.

President of the United States

The President may issue an "Emergency" and/or "Major Disaster" declaration. This declaration provides the catalyst for a variety of reactions from government agencies at multiple levels. For instance, the President's federal disaster

declaration opens the same doors to low-interest loans and other mitigation prospects as one from the Secretary of Agriculture.

Other Federal Drought Assistance

Most agencies described in the federal section of the plan can provide drought-related public education and assistance materials.

Interestingly, the plan ignores two of the organizations with potentially the greatest power to mitigate drought - the State Legislature and U.S. Congress. These organizations have the ability to determine the amount of emergency monies provided for loans and other mitigation programs. Both can change existing law or situations which may not be conducive to drought mitigation.

Chapter 4
A History of Two Droughts

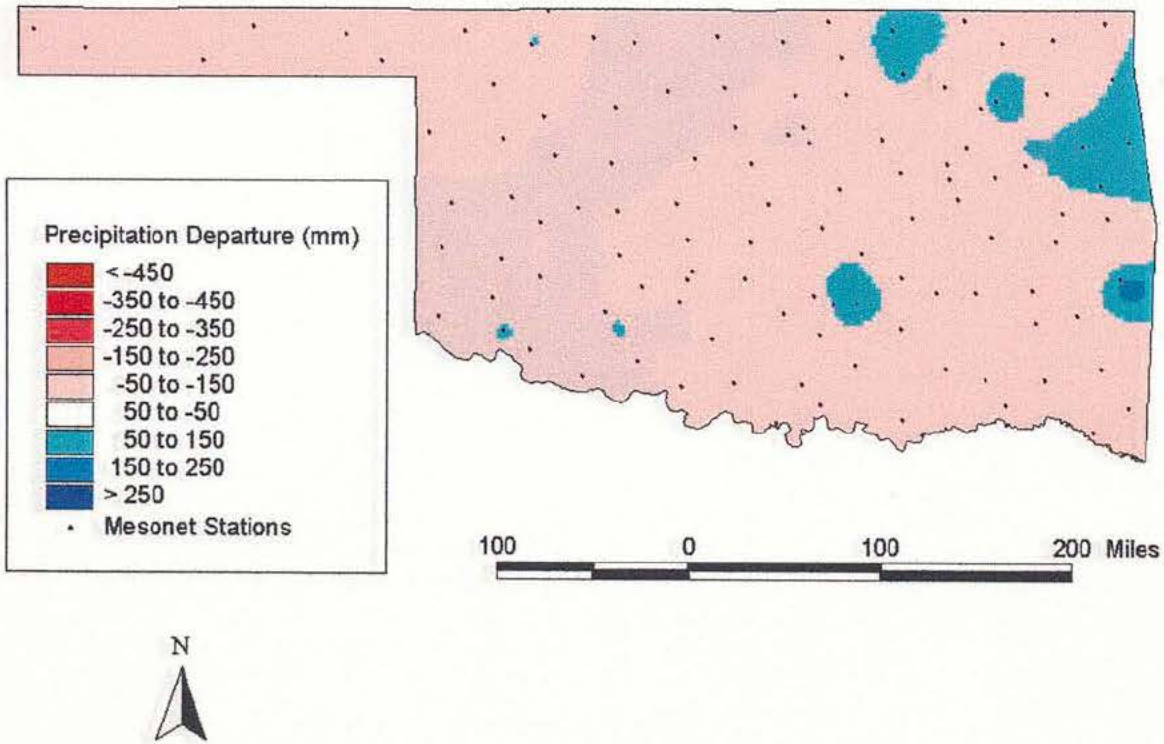
The droughts of 1995-96 and 1998 share many similarities, though the saddest of these has to be the loss of life and scores of farmers and ranchers who lost their livelihoods to a mitigatable disaster. The two droughts begin the same way. Slow days pass without rain, when old timers keep notes in worn pocket sized notebooks hidden in their breast pockets. They begin thumbing back through the pages, looking for the last day of rain recorded. It's found with a sigh and the realization hits that the phone calls have to begin- the phone calls to find who's doing what and where help will come from.

Farmers and ranchers expect the government will have everything in place to help but it wasn't until January 11, 1996, following seven months with little to no precipitation, that Governor Frank Keating requested disaster assistance from the U.S. Department of Agriculture (*Tulsa World,* May 25, 1996).

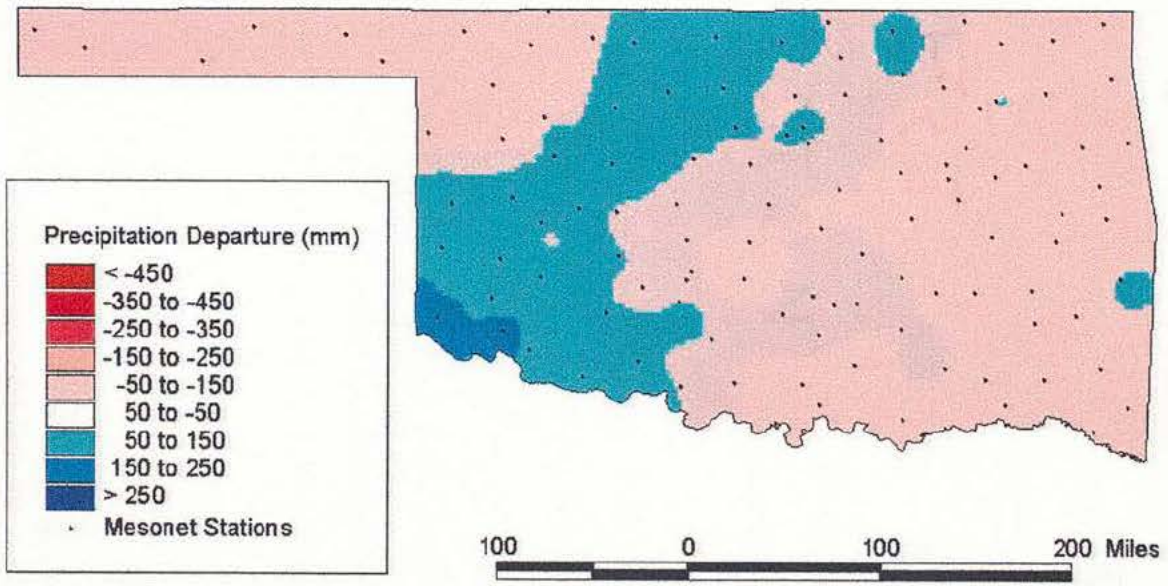
The drought began in July 1995, following an extremely wet spring, especially April, that had caused some flooding. On July 10, the city of Norman used its maximum daily water supply. The next day brought similar usage. The city considered implementing the first stage of its water rationing program. When the city logs three consecutive days of water use above 18.5 million gallons it implements phase one, or "good judgement" phase. The city implements its second and third phases when usage hits 19 million gallons per day for three consecutive days and 20 million gallons per day for three consecutive days, respectively. Phase two restricts lawn watering to alternating days, based on odd or even street addresses. This phase allows hand watering, that is, watering by holding a water hose or other water sprinkling device in one's hand through out the day. Phase three allows only hand water from sundown to sunup only. At this point in the summer, the city already had problems replenishing its tower water supply for the next day and users experienced low/high pressure surges (*The Daily Oklahoman*, July 12, 1995).

November of 1995 spawned the first of many burning seasons Oklahomans

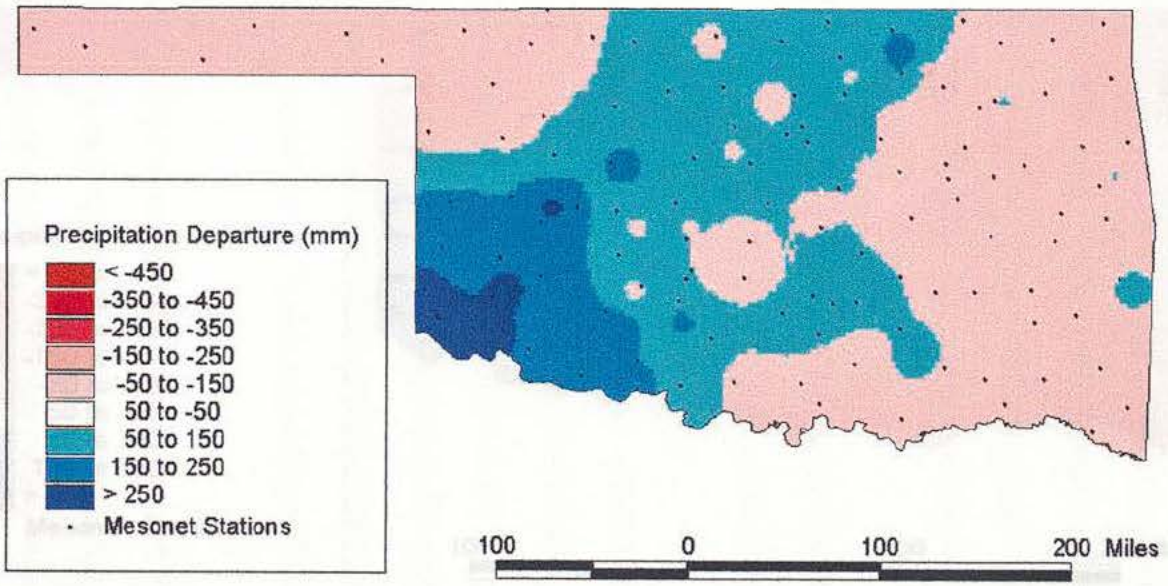
Precipitation Deviation from Normal
1 July 1995 - 31 July 1995



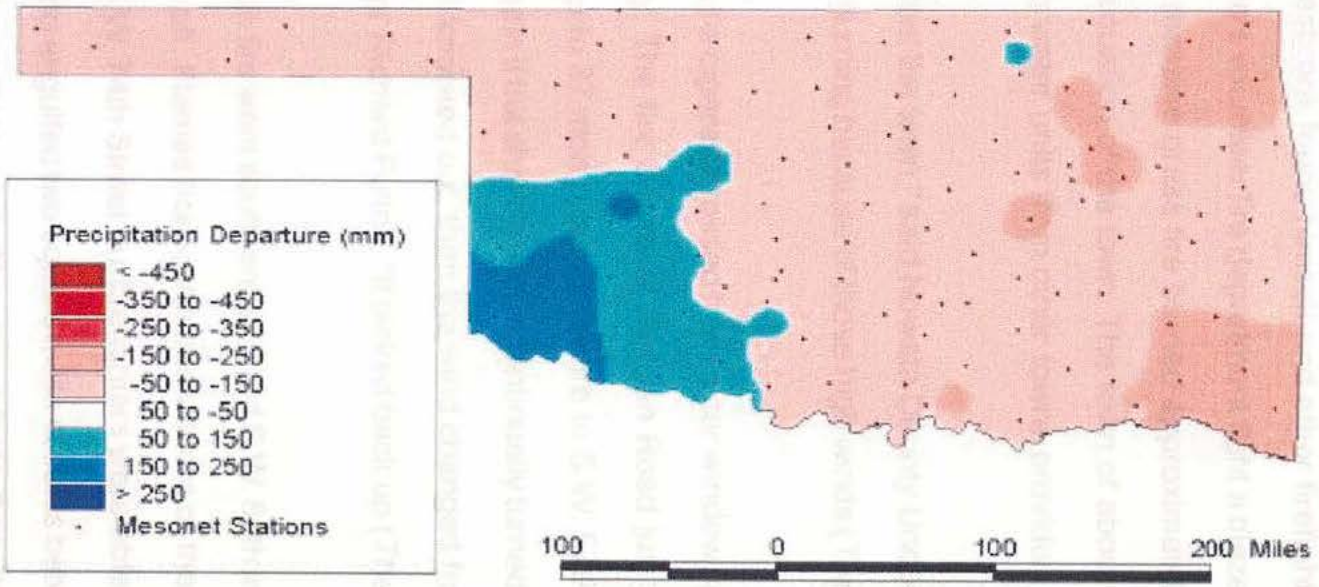
Precipitation Deviation from Normal
1 July 1995 - 31 August 1995



Precipitation Deviation from Normal
1 July 1995 - 30 September 1995



Precipitation Deviation from Normal
1 July 1995 - 30 November 1995



would experience during the two droughts. Fire conditions were ripe. In the two months prior some northeastern areas received only half-inch of rain. The National Weather Service issued a wind advisory on November 9. The same day Bartlesville Fire Chief Bob Hasbrook issued a fire caution statement.

Later that day Hasbrook found himself and other firefighters from 15 towns helping the town of Wann's volunteer fire department fight a blaze that threatened to wipe out the town. The massive grass fire burned approximately 2,400 acres and forced the complete evacuation of the town. The town of about 150 residents has only one fire hydrant so water units from other towns provided much of the water used to out the blaze.

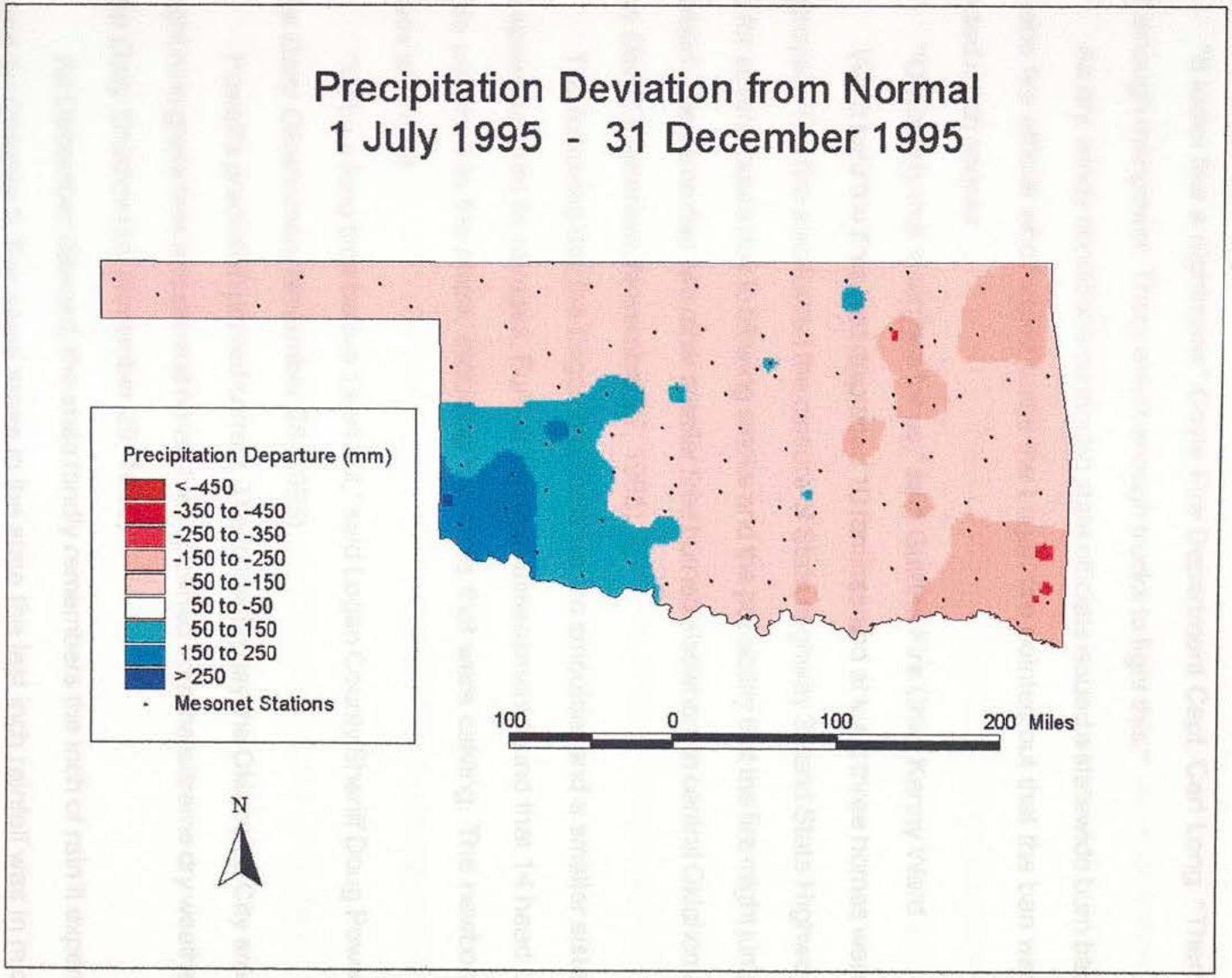
"We could have lost the town," said Nowata County Undersheriff Jim Hallett. "It would have still been burning because of those high winds (*The Daily Oklahoman*, November 10, 1995)."

The following day a cigarette tossed from a car window spawned a massive blaze in Oklahoma City. The fire began at Morgan Road just passed S.W. 44th Street. Wind gusts of up to 37 mph pushed the fire to S.W. 57th Street at 30 mph. Fire fighters tried to contain it but shifting winds continually turned the fire's direction.

"We about had it knocked out, then the wind changed from the north," said Oklahoma City firefighter Richard Fulton. "It picked back up (*The Daily Oklahoman*, November 11, 1995)."

The half-mile-wide fire went south and jumped S.W. 59th in four places before firefighters could cut it off. Flames licked the back doors of the Canadian Estates development north of S.W. 74th Street but firefighters were able to save the homes from damage. The inferno engulfed two square miles of fields between Morgan Road and County Line Road and S.W. 44 th Street and S.W. 74th Street before the 80 firefighters and 24 rigs from seven cities and towns could extinguish it.

Less than two weeks later, on November 26, a massive grass and brush fire


Precipitation Deviation from Normal
1 July 1995 - 31 December 1995
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
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forced the evacuation of Langston University and burned one firefighter. The fire engulfed several square miles of eastern Logan County. By nightfall the six-mile wide fire seared about 3,500 acres.

"It looks like a nightmare," Coyle Fire Department Capt. Carl Long. "There isn't enough manpower. There aren't enough trucks to fight this."

As dry, windy conditions continued state officials issued a statewide burn ban but one fire official who helped battle the Logan fire pointed out that the ban was needed much sooner.

"Obviously that is too late for us," said Guthrie Fire Chief Kenny Ward.

Ward said the fires had displaced 10 families and at least three homes were destroyed. The fire also forced the closure of State Highway 33 and State Highway 105 for several hours due to blowing smoke and the possibility that the fire might jump the road. The same day, two other smaller fires burned elsewhere in central Oklahoma (*The Daily Oklahoman*, November 27, 1995).

The following day the Logan fire continued to smoulder and a smaller sister fire spawned from its ravages. Further damage assessment found that 14 head of cattle perished in the blaze, including two cows that were calving. The newborn calves also died.

"It'll be a long time before it's all out," said Logan County Sheriff Doug Powell (*The Daily Oklahoman*, November 28, 1995).

Powell's prediction proved correct. The following day the Oklahoma City area fought nine grass fires and several house fires spawned from the extreme dry weather (*The Daily Oklahoman*, November 29, 1995).

As December dawned, the state fondly remembers the inch of rain it experienced on October 2. For some areas in the state the last inch rainfall was in mid-September. The National Weather Service called the period a 60-day drought, ignoring that summer's conditions. In this "60-day drought," Oklahoma City experienced

416 grass fires. The state issued a red flag fire alert (*The Daily Oklahoman*, December 1, 1995). The alert remained in effect the following day but the state avoided instituting a burn ban, though forest fires had burned more than 18,000 acres in eastern Oklahoma since November 18. That figure did not include the acres lost in central and western Oklahoma to grass, brush and forest fires during the same period (*The Daily Oklahoman*, December 2, 1995).

Meanwhile, wheat farmers and cattle ranchers begin looking at the weather and their fields and begin the litany of laments that would go unheard by the government for the next three years.

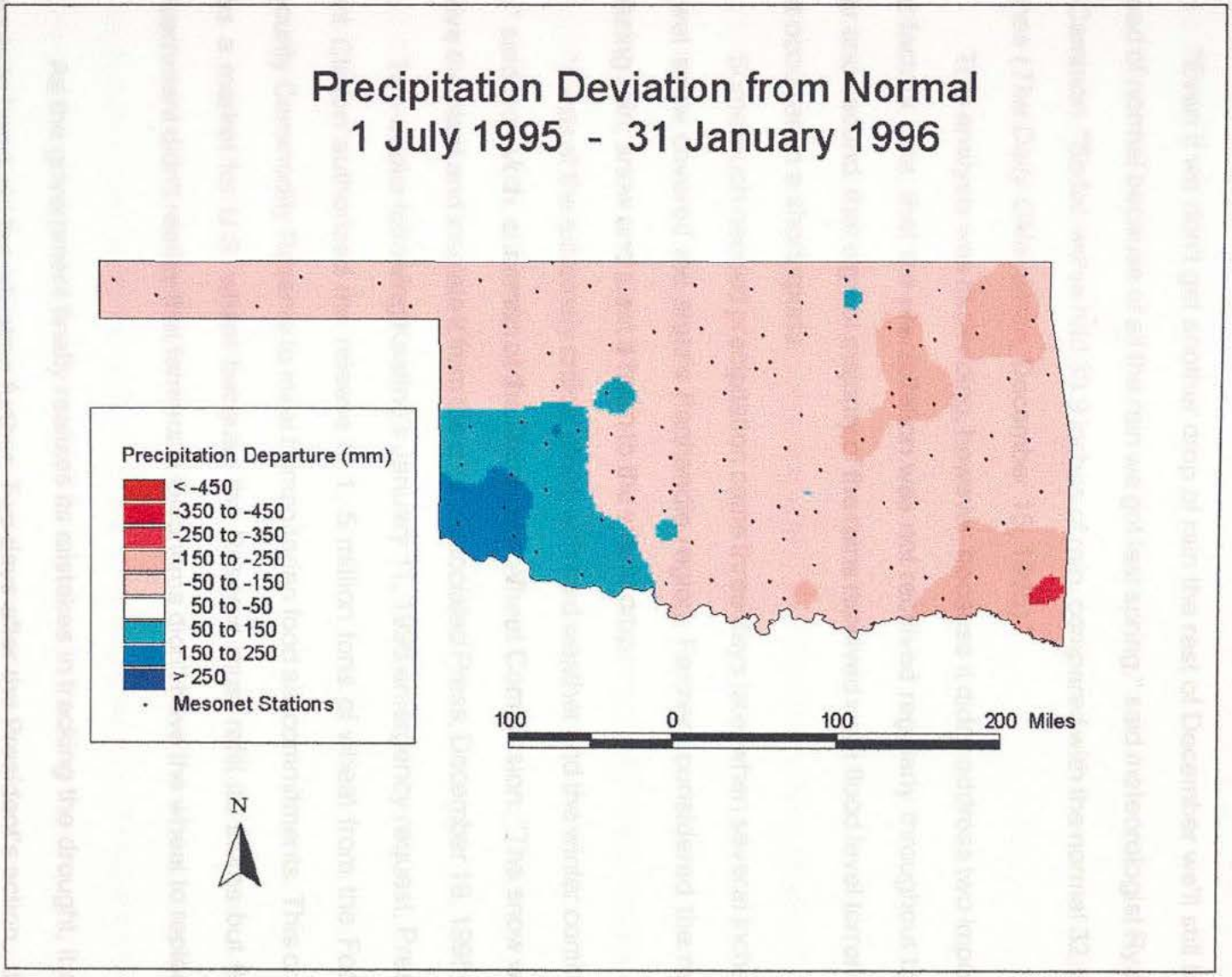
"This has been a disastrous grazing season," said Jarold Callahan, executive vice-president of the Oklahoma Cattlemen's Association. "It will probably be the leanest wheat pasture year on record (*The Daily Oklahoman*, December 15, 1995)."

Most wheat farmers buy stocker cattle to graze their lands during the season that native grasses die. The drought stunted the spring wheat planted so badly that they couldn't graze cattle.

"The wheat is in such condition that cattle grazing it could damage the crop by pulling it up by the roots," said Tom Glazier, Oklahoma Wheat Growers Association president.

Barry Bloyd of the Oklahoma Agricultural Statistics Service confirmed the situation. He said Oklahoma has a normal wheat planting of seven million acres with 37 percent of that used for grazing cattle. In 1995, the grazing figure dropped to nine percent (*The Daily Oklahoman*, December 15, 1995).

This produced one of the drought's first major economic effects outside the direct agricultural producer's losses. Since farmers had less grazing land, they didn't buy cattle from producers and then sell them at feedlots. This interruption of cash flow in the cow and calf operations cut income at many levels and saw a subsidiary effect on related agri-businesses.


Precipitation Deviation from Normal
1 July 1995 - 31 January 1996
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
> 250
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The state's meteorologists didn't look at the timing of precipitation as a problem. Instead, they viewed the problem in purely statistical terms -in light of yearly totals.

"Even if we don't get another drop of rain the rest of December we'll still be ahead of normal because of all the rain we got last spring," said meteorologist Ryan McCammon. "So far, we've had 33.9 inches of rain, compared with the normal 32.51 inches (*The Daily Oklahoman*, December 15, 1995)."

This analysis was misleading, however, because it didn't address two important factors: first, that the precipitation was not received regularly throughout the year and second, that a great majority of the rains received were flood level torrents that occurred in a short spurts.

Some much needed precipitation came three days later when several inches of wet snow covered the state's Panhandle region. Farmers considered the mix freezing rain, snow and sleet a boon to the wheat crop.

"It was at the extremely critical stage with cold weather and the winter coming on," said Ron Voth, chairman of the Oklahoma Wheat Commission. "The snow will revive the plant and insulate it from the cold (*Associated Press*, December 19, 1995)."

Two weeks following Keating's January 11, 1996 emergency request, President Clinton authorized the release of 1. 5 million tons of wheat from the Food Security Commodity Reserve to meet humanitarian food aid commitments. This creates a market for U.S. wheat because the Reserve must refill its stores but the government didn't realize that farmers in Oklahoma didn't have the wheat to replace it.

As the government finally realizes its mistakes in tracking the drought, it attempts to band-aid the situation further. Two days after the President's action, the United States Department of Agriculture permits farmers with Conservation Reserve Program contracts expiring in 1996 to terminate the contracts early and bring the

acreages back into production this crop year. This increases the immediate lands available to agricultural producers who have CRP lands but does nothing to help those without.

Weather extremes are as predictable as a rooster's crow in Oklahoma and by late January quick moving cold fronts and rapid temperature drops freeze-dried the state's wheat fields.

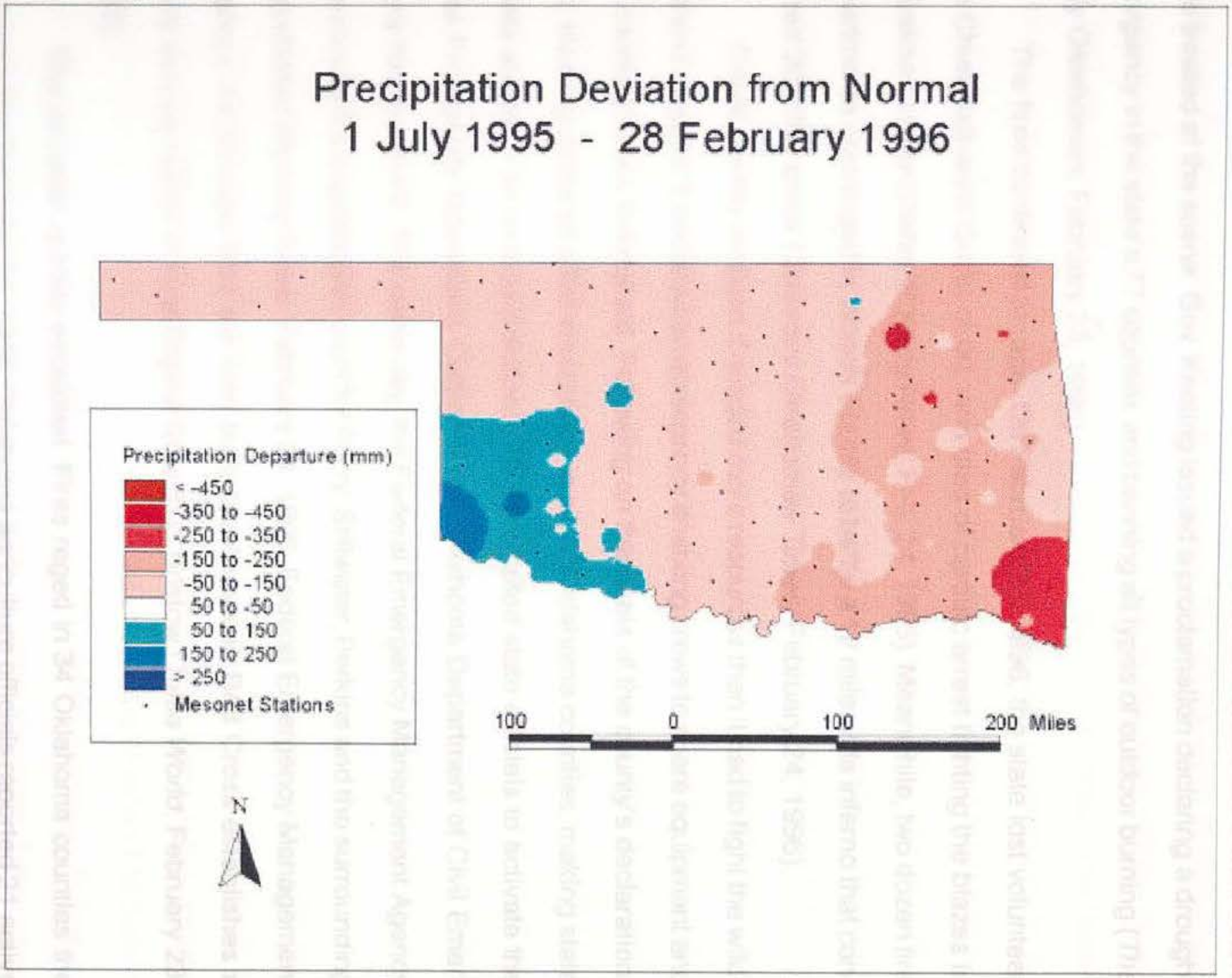
"We don't have much cover as far as forage goes," said Mark Hodges, executive director of the Oklahoma Wheat Commission. "Any excessive wind we get, soil is starting to move, and it's got me really concerned, especially coming into February and March when we traditionally get some wind (*The Daily Oklahoman*, January 27, 1995)."

Those high winds combined with quick temperature drops cause topsoil to blow away. The autumn drought had so stunted the wheat's growth that it remained mere stubble in the ground so there was no growth to hold topsoil in place.

By early February, some of Oklahoma's top wheat producing counties reported that half their crops had been wiped out. Some farmers ripped up strips of their fields to form wind blocking barriers to try to save their crop. Only 9 percent of the wheat in Oklahoma was rated in good condition (*The Daily Oklahoman*, February 1996).

Just as the state and federal government began swinging into action, another drought related disaster strikes when on February 13, 1996, wildfires begin burning throughout the state. Rather than turning to a well-thought out plan of mitigation the government begins grasping at straws. Five days later, Governor Keating, leading the unprepared state government, declared a statewide day of prayer for rain and for farmers.

On February 22, authorities were forced to close a mile of Interstate 35 in Logan County as wildfires burning there jumped the road. More than 90 firefighters


Precipitation Deviation from Normal
1 July 1995 - 28 February 1996
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
> 250
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100
200 Miles
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from more than 10 fire departments converged on the Logan county fires. In Harrah, another fire destroyed 640 acres and one home. Two firefighters were hospitalized one for a back injury, the other for smoke inhalation and heat exhaustion while others were treated at the scene. Gov. Keating issued a proclamation declaring a drought emergency in the state's 77 counties and banning all types of outdoor burning (*The Daily Oklahoman,* February 23, 1996).

The fires continued to rage. On February 23, 1996, the state lost volunteer Fire Chief Nathaniel Quinn of IXL who died of cardiac arrest fighting the blazes in Okfuskee County (*Dallas Morning News*, Feb. 24, 1996). Meanwhile, two dozen fire departments converged in Woods County to battle a 12 mile wide inferno that consumed 200,000 acres (*Saturday Oklahoman Times,* February 24, 1996).

Creek County realized it needed more resources than it had to fight the wildfires and drought. It declared an emergency enabling crews to share equipment and the county to seek federal aid. Following on the heels of the county's declaration, Gov. Keating declared a fire emergency in all 77 Oklahoma counties, making state assets available to local jurisdictions. This prompted state officials to activate the State Emergency Operations Center of the Oklahoma Department of Civil Emergency Management. The same day, the Federal Emergency Management Agency approved a fire suppression grant for Perry, Stillwater, Perkins and the surrounding area (*Dallas Morning News*, February 24, 1996; Federal Emergency Management Agency). As damage from the fires built, the American Red Cross establishes a family service center at First Baptist Church in Bristow (*Tulsa World*, February 23, 1996).

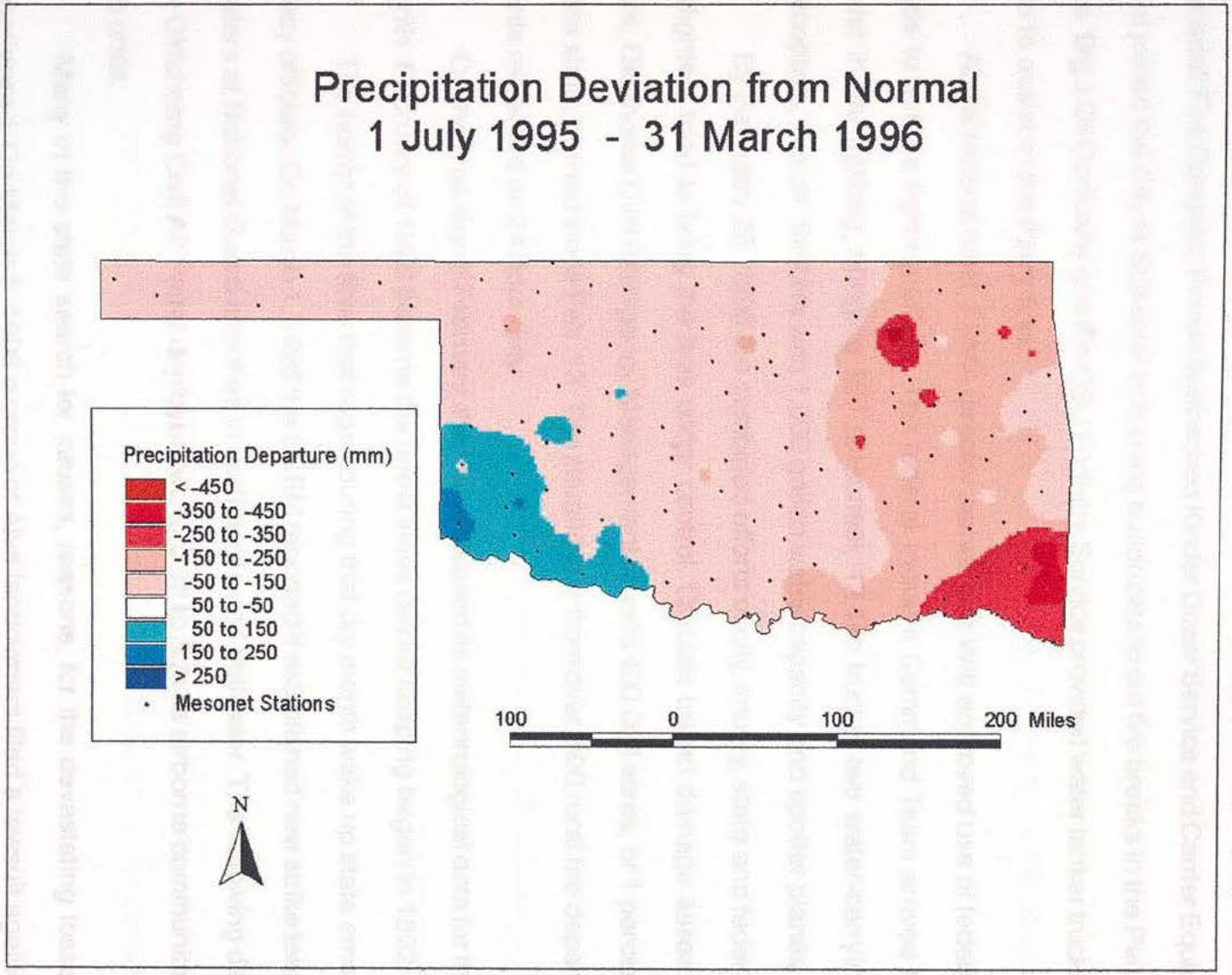
The situation quickly escalated. Fires raged in 34 Oklahoma counties the following day, February 24, 1996. Oklahoma agriculture officials reported 21 active fires across the state. The Civil Air Patrol deployed two aircraft as airborne communication relay units so firefighters could use hand held radios to communication through-

out the siege.

Wildfires caused a transportation shut down. The Highway Patrol closed a seven-mile stretch of Interstate 44 north of Lawton due to fires and a 12 mile stretch of Interstate 35 near Perry (*Dallas Morning News*). Okfuskee County officials closed U.S. Highway 62 and State Highway 48 (*Saturday Oklahoman Times*). The reason for the road closures became obvious when, ironically, a Cushing and an Ingalls fire truck collided on State Highway 51 in dense smoke crushing the legs of two firefighters who were riding on the platform on the front of the Cushing truck (*Stillwater News Press*, February 25, 1996). The out of control fires burned an Okemah Fire Department tanker but the team sustained no casualties (*Saturday Oklahoman Times*).

The state government began assembling its response. Oklahoma Civil Emergency Management opened a wildfire command center in Oklahoma City to coordinate federal and state mitigation efforts. State officials also activated the South-Central Forest Fire Protection Compact, allowing the state to use U.S. Forest Service equipment and personnel. Insurance commissioner John P. Crawford declared a state of emergency, which set up procedures to issue licenses to emergency adjusters (*Saturday Oklahoman Times*). Finally, the governor declared an outdoor burn ban for all 77 counties (*Dallas Morning News*).

February 25, 1996 brought news of the massive losses of homes and farm lands. State officials report losses of 54 homes and more than 250,000 acres from February 23rd's fires (*Tulsa World*, February). Creek County, alone, lost 32 homes. The fires destroyed a 50-square-mile ring of area surrounding Bristow (*The Sunday Oklahoman).* The Red Cross reported damage in 11 counties: Pittsburg, Delaware, Payne, Blaine, Oklahoma, Pottawatomie, Cleveland, Carter, Okfuskee, Tulsa, Creek but closed the Bristow service center after all of the families who reported there found places to stay (*Tulsa World;* American Red Cross press release). The Oklahoma Department of Agriculture Forestry Division released precautions for rural


Precipitation Deviation from Normal
1 July 1995 - 31 March 1996
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
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home owners to reduce the risk of wildfire damage.

From across the state, those that could help, did. The Oklahoma Army National Guard provided a helicopter with water bucket to fight the Sperry-Skiatook-Barnsdall Fire Complex. Private businesses Kinder Dozer Service and Carrier Equipment joined the City of Stillwater in loaning bulldozers to cut fire breaks in the Perry fires. Big J Oil Company and the OSU Forestry Service provided water tanker trucks, also to assist in the Perry fires.

At the federal level, FEMA director James Lee Witt approved use of federal funds to aid fire fighting efforts. The federal Incident Command Team arrived to assist in fire fighting, bringing 150 personnel, 12 fire trucks, two water-carrying helicopters, two air tankers with 1,000 gallon water capacity and spotter planes.

By February 26, 1996 the combined efforts of city, county, state and federal firefighters tried to bring the fires under control. Officials began damage assessment. Oklahoma Civil Emergency Management reports 400,000 acres, or 1 percent of the state, burned since Feb. 13. The situation far from over, 800 rural fire departments remained on 24 hour duty.

On the final day of February, the state released its meteorological data for the month. February of 1996 became the driest since record keeping began in 1892.

The horror of the fires that raged during that dry month wake up state emergency officials. On March 1, 1996 the OCEM reported it established new strike team centers at National Guard armories in Bartlesville and Stillwater. The following day the Oklahoma Civil Air Patrol deployed two aircraft to Ada as airborne communication units.

Many in the state search for causes, reasons, for the devastating losses experienced. On March 5, 1996 a group of Alva landowners filed a lawsuit against Alfalfa Electric Cooperative Inc., alleging fires that destroyed 200,000 acres started from an AECI truck used as a power source. State fire officials suspected arson in

most of the fires that ravaged Oklahoma that February.

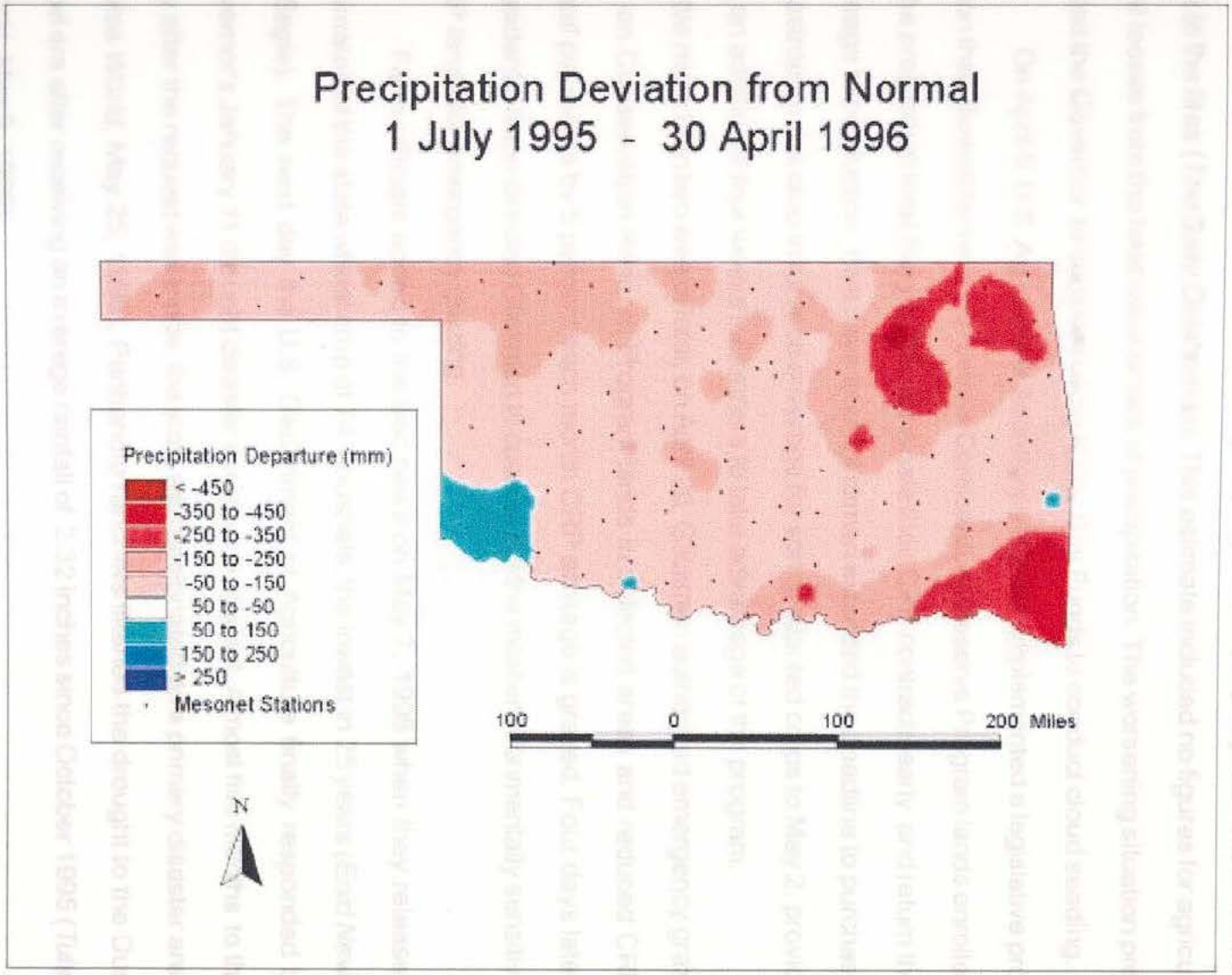
As the situation worsened, the government at all levels reacted. On March 7, 1996 President Clinton ordered additional federal aid for firefighting resources in Oklahoma. The help was needed. By March 11, 1996, more than 4,000 acres burned in 46 separate wildfires across the state (*The Daily Oklahoman*). The next day FEMA approved two additional Federal Fire Suppression grants for the Sperry-Owasso and Little Axe fire complexes (Oklahoma Department of Civil Emergency Management).

March 12, 1996 wind erosion reports showed 1.8 million acres in western Oklahoma at risk for serious wind erosion. The amount of land in "condition to blow" reached a twenty year high (U.S. Department of Agriculture).

The following day dawned with more impossible to control fires springing up making additional road closures necessary. Firefighters from 10 departments battled an eight square mile blaze that forced the temporary closure of U.S. 75 and Oklahoma 20. The Oklahoma National Guard provided Blackhawk helicopters to combat the inferno (*Tulsa World*). The blazes broke into another destructive rage injuring three firefighters and one Tulsa County sheriff's deputy and destroying three homes in Taft (*The Daily Oklahoman*).

March 14, 1996 brought the first direct assistance ranchers see from the drought when the Creek County Hay Relief Project received 400 bales of hay from Missouri farmers. Burlington Northern Railroad provided railcars to transport hay from Missouri to Oklahoma but Creek County needed drivers and trucks to distribute it (Oklahoma Department of Agriculture).

The next day the Oklahoma Agricultural Statistics Service released its 6 month report. It reported precipitation levels less than half of normal in multiple regions (OASS, 6 month report). With precipitation at continually less than half normal levels, firefighters saw no assistance on the way from Mother Nature. Oklahoma Civil


Precipitation Deviation from Normal
1 July 1995 - 30 April 1996
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
> 250
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Emergency Management also released a report . Since February 13 , 1996 the state had lost 600,000 acres to wildfires. Fires had caused two deaths, 12 injuries and destroyed more than 50 homes. The agency reported a property loss of $1.4 million due to the fires (*The Daily Oklahoman).* This estimate included no figures for agricultural losses from the heat wave or lack of precipitation. The worsening situation provoked the Governor to consider using Rainy Day Funds to conduct cloud seeding.

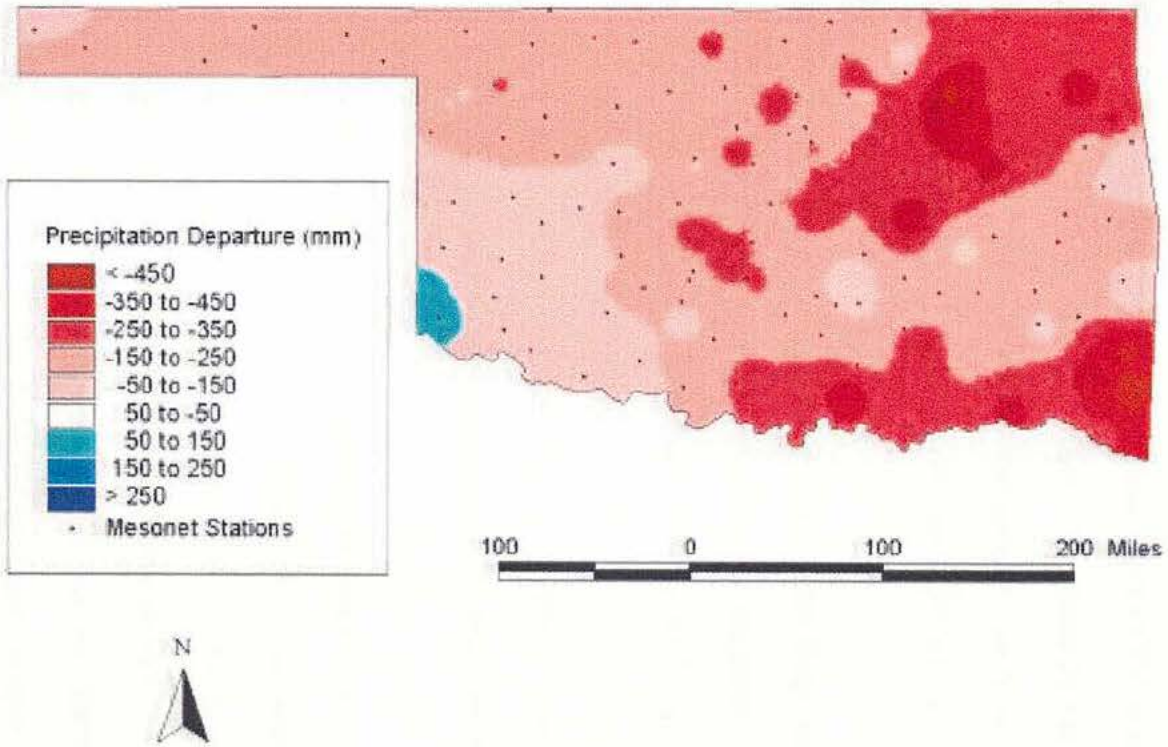
On April 5, U.S. Agricultural Secretary Glickman implemented a legislative provision that allowed farmers with certain Conservation Reserve Program lands enrolled in the program at least five years to terminate their CRP contracts early and return the acreage to production. Five days later, Glickman extended the deadline to purchase catastrophic risk crop insurance coverage for spring-planted crops to May 2, providing an additional four weeks for farmers to take advantage of the program.

A little more than two weeks later, on April 26, Glickman authorized emergency grazing on Conservation Reserve Program lands in selected areas and reduced CRP rental payments by 5 percent each month CRP acreage is grazed. Four days later, President Clinton directed Glickman to open all but the most environmentally sensitive CRP lands for emergency grazing.

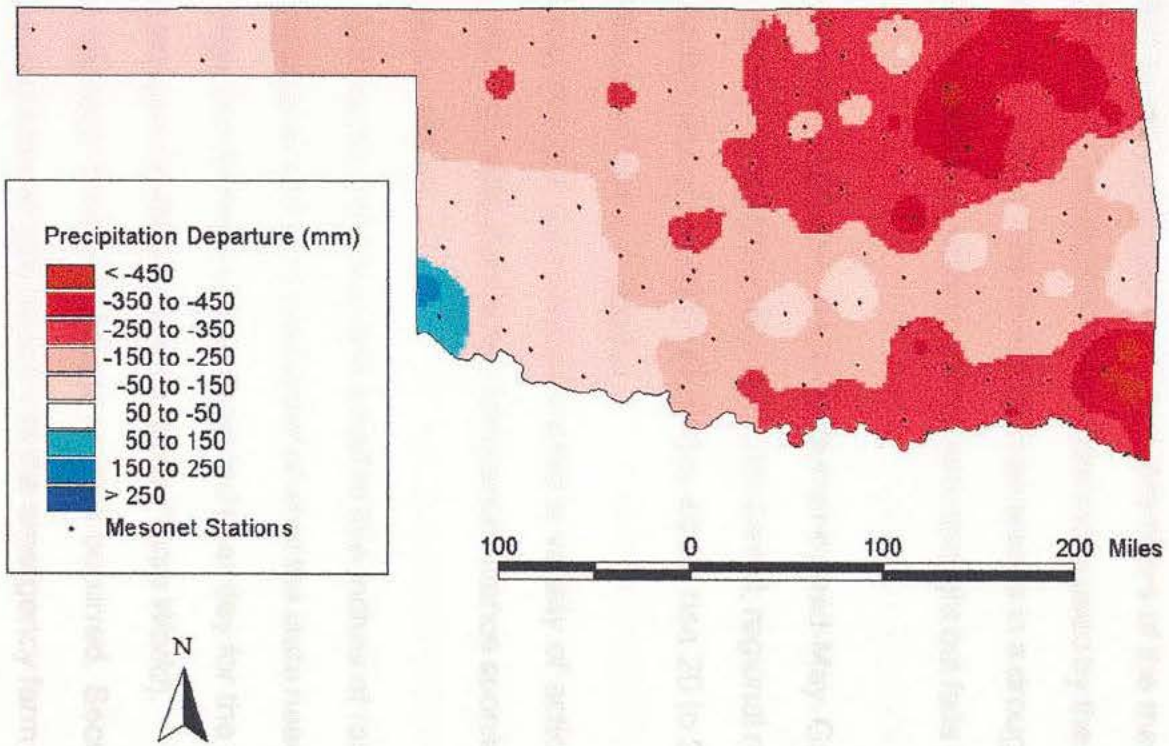
Farm officials added to the bad news on May 7, 1996 when they released estimates of the state wheat crop at 74.1 bushels, the lowest in 25 years (*Enid News & Eagle*). The next day the U.S. Department of Agriculture finally responded to governor's January 11 drought disaster assistance request. Almost five months to the day after the request was made, the state was designated as a primary disaster area (*Tulsa World,* May 25, 1996). Panhandle ranchers likened the drought to the Dust Bowl era after receiving an average rainfall of 2.32 inches since October 1995 (*Tulsa World,* May 9, 1996).

Oklahoma Agriculture Secretary Dennis Howard released an estimate on May 10, 1996 that 50 percent of Oklahoma's 70,000 farmers and ranchers would not

Precipitation Deviation from Normal
1 July 1995 - 31 May 1996



Precipitation Deviation from Normal
1 July 1995 - 30 June 1996



make their July 1 mortgage payment (*The Journal Record*) and that between 1,000 and 10,000 farmers would default on loans (*McAlester News-Cap & Democrat*). The US Secretary of Agriculture officially recognized the Oklahoma drought crisis (*McAlester News-Cap & Democrat*).

Farmers interviewed by the media say they'd be better off betting in Las Vegas than on the season's crops (*Associated Press*). Members of the media criticized the Palmer Drought Severity Index (PDSI), the main index used by the government at the state and federal levels to determine when an area is in a drought (*Enid News & Eagle*). The PDSI is useful for predicting long-term drought but fails in short-term drought.

The drought began reaching the average consumer by mid-May. Grain and hay shortages forced a rise in cost of milk production. Jim Carroll, regional manager of Associated Milk Producers, Inc. predicted milk prices would rise 20 to 25 cents during the next few weeks (*Enid News & Eagle*).

The ever-increasing drought problems prompted a variety of actions from Oklahoma residents. On May 13, 1996 the Clinton Ministerial Alliance sponsored the Prayer Vigil for Rain (*Clinton News*).

One week later, on May 20, 1996 two and a half to five inches of rain fell on Oklahoma. The storm brought just a drop in the bucket of what the state needs. Todd Lindley of the National Weather Service said only an inch per day for the next ten days could alleviate the drought conditions still prevalent (*Tulsa World*).

Three days later, another round of federal actions occurred. Secretary of Agriculture Dan Glickman transferred $56 million into the emergency farm loan account from the Conservation Reserve Program for loans to farmers and ranchers affected by the drought (USDA). He also authorized the Uninsured Assistance Program to cover losses on small grains used for forage. Federal Emergency Management Agency Director James Lee Witt named FEMA Region VI Director R.L. "Buddy"

Young chair of the multi-state drought task force (FEMA). Quickly following this, on May 25, 1996 the Federal Emergency Management Agency called for its multi-state task force to meet in the last week of June.

The public saw the need for an immediate response the next day when state agriculture officials also reported that the drought has caused $1.2 billion in economic loss (*McAlester News-Cap & Democrat*). Oklahoma Agriculture Secretary Dennis Howard reported that farm bankruptcies in the Western District were up 40 percent from a year before and Farm Service delinquency rates had tripled (*The Duncan Banner*). Farmers weren't the only ones hurting though. Ranchers continued to lose money on cattle they had been unable to beef up. Those selling cattle at Beaver City Stockyards received $350 per head, as opposed to last year's $800 per head (*The Sunday Oklahoman*).

As the month came to a close the federal government continued to scramble for ways to improve the situation. President Clinton ordered $70 million in federal assistance for drought assistance while U.S. Agriculture Secretary Dan Glickman requested White House permission to release 48 million bushels of grain held in government reserve to aid livestock producers (*Associated Press,* May 30, 1996). The U.S. Small Business Administration made Economic Injury Disaster Loans available to agri-businesses depending on farmers and ranchers in Oklahoma.

Early June brought a Congressional visit and additional USDA assistance. Sen. Don Nickles traveled from Washington, D.C. to visit farms in north-central Oklahoma to survey damage (*Guymon Herald,* June 1, 1996).

On June 2, the USDA extended coverage of its non-insured crop disaster assistance to grain producers suffering major small grain and forage crop losses (*Kingfisher Times & Free Press*). Oklahomans needed all the help they could get. The same day, OSU agricultural meteorologist J.D. Carlson reported that it would take 20 inches of rainfall to end the drought (*Tulsa World*).

The state's residents still had not realized the seriousness of the situation. Cities did not require conservation of water so some experience such unlimited consumer usage as to endanger the continued availability of the resource. For instance , the city of Tulsa reported a pumpage of 133 million gallons per day for the third week of May and 105 million gallons per day for the final week of May. Normal usage is 86 million gallons per day (*Tulsa World*).

On June 25, 1996, the Oklahoma Department of Agriculture delivered some disheartening news to the public. With 80 percent of the wheat reaped, Oklahoma turned in its smallest harvest in 25 years. To add to it, the drought caused the abandonment of one million acres (Oklahoma Department of Agriculture).

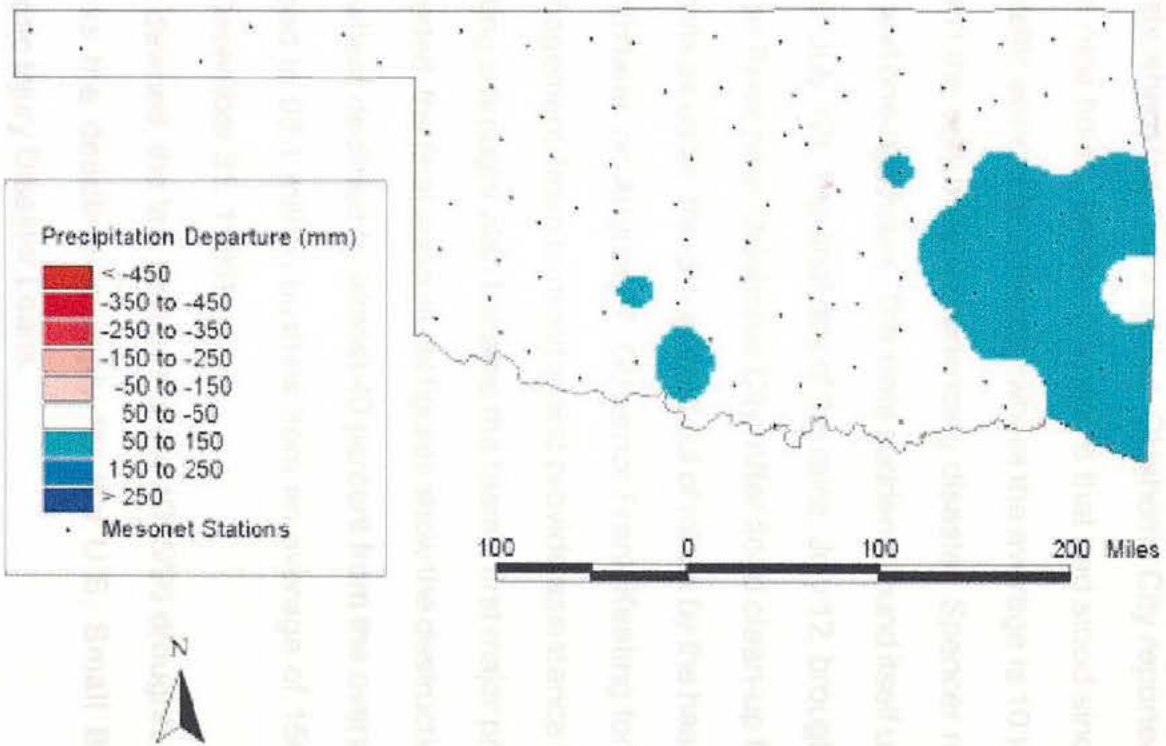
The next day heavy rains brought 65 percent of the state's topsoil to adequate moisture level, according to Oklahoma Agricultural Statistics Service, but that still wasn't enough to end the drought . It was too late for farmers because they had already harvested 87 percent of the season's crop (*Tulsa World*).

Less than a week later, on July 1, President Clinton declared the Southwest and other areas of the U.S. in a state of emergency that warranted the release of the Feed Grain Disaster Reserve. The same day, Agriculture Secretary Dan Glickman announced the availability of $40 million in assistance for livestock producers to purchase feed.

July 7 found Oklahoma state Senator Stratton Taylor requesting drought assistance for Rogers and Mayes counties from State Agriculture Secretary Dennis Howard (*Pryor Times*). The reason remained obvious. The torrent of rains two weeks before was hardly enough to end the drought. The next day the Oklahoma Water Resources Board reported the average rainfall deficit in Oklahoma since October 1, 1995 is 10.30 inches.

The state desperately needed rain but at a slow, steady pace. That wasn't in the cards though. Two days after the Water Board's report Oklahoma's hard baked

Precipitation Deviation from Normal
1 October 1997 - 31 October 1997



desert-like ground saw the beginning of a three-day rain that pelted the state causing floods and breaking the triple-digit heat wave. On July 10, Oklahoma City received 2.79 inches of rainfall shattering the previous daily record of 1.9 inches set in 1945 (*Alva Review-Courier*, July 12).

The second day of torrents, July 11, brought rains so hard they caused roads to flood and strand motorists where their cars stalled. Oklahoma City reported record rainfall of 2.67 inches in nine hours, breaking a record that had stood since 1906. Conditions caused 42 traffic accidents in the city where the average is 10 to 12 per day. But the cities weren't the only ones experiencing disaster. Spencer recorded 6.82 inches of rain in 16 and one-half hours. The state suddenly found itself underwater (*Alva Review-Courier*, July 12). The final day of the rains, July 12, brought an 11-foot rise on the Canadian River near Oklahoma City. After flood clean-up finished, Oklahomans returned to life as usual, the drought put out of minds by the heavy rains.

More than a month later, on August 27, Governor Frank Keating formed the Oklahoma Drought Management Team to monitor and provide assistance in future drought situations. Writing a drought plan became the team's first major project.

When the year ended, the final agricultural figures show the destruction of the drought. Production of wheat declined by almost 40 percent from the average. The year's wheat yield dipped to 93.1 million bushels from an average of 150 million bushels (*Hugo News,* December 31, 1996).

As the new year dawned, the last vestiges of the 1995/96 droughts passed. January 6, 1997 marks the deadline to apply for the U.S. Small Business Administration's Economic Injury Disaster Loans.

February 1997 saw the governors of North Dakota, New Mexico, Colorado, Arizona and Texas and the U.S. Secretary of Agriculture and U.S. Secretary of the Interior form the state/federal Drought Policy Coordination Council to plan for and implement drought relief measures.

On August 4, 1997, more than two years after the 1995 drought began and one year after formation, the Oklahoma Drought Management Team considered adopting the final Drought Management Plan. They'll need it. Less than one year from adoption, they must implement the plan when drought again hits Oklahoma. Though the summer of 1998 began with a positive agricultural outlook, it took mere weeks for the horror to begin again.

The year 1998 began well. The growing season saw the state's major export crop, wheat doing remarkably well and on June 13, 1998 the U.S. Department of Agriculture forecasts the sixth largest wheat harvest for Oklahoma (*The Daily Oklahoman*). But, this is Oklahoma, a state known for its natural disasters. A little more than two weeks later, on June 29, 1998, Governor Frank Keating requested a federal agriculture drought declaration for 31 Oklahoma counties (*The Daily Oklahoman,* June 30, 1998*).* The governor also issued a burn ban for 10 counties (*The Daily Oklahoman*).

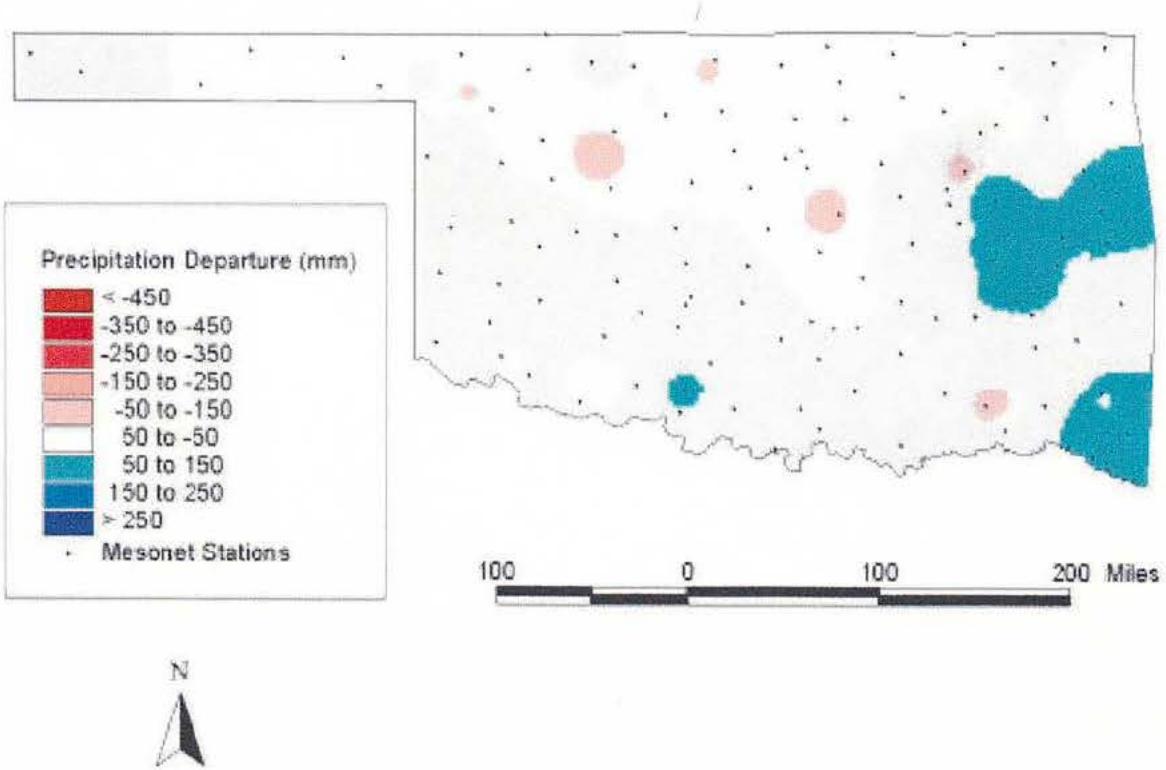
Just as 1996 broke or matched records for previous worst case scenarios the state had seen, so did the summer of 1998. Farmers watched in horror as topsoil moisture hit its lowest level since May 1996 and subsoil moisture hit its lowest level since July 1996 (*The Daily Oklahoman*).

Only one day after issuing his initial burn ban, the governor updated it. He included 15 counties: Cimarron, Texas, Beaver, Harper, Woodward, Ellis, Dewey, Roger Mills, Custer, Beckham, Washita, Kiowa, Greer, Harmon, Jackson (Office of Governor Frank Keating).

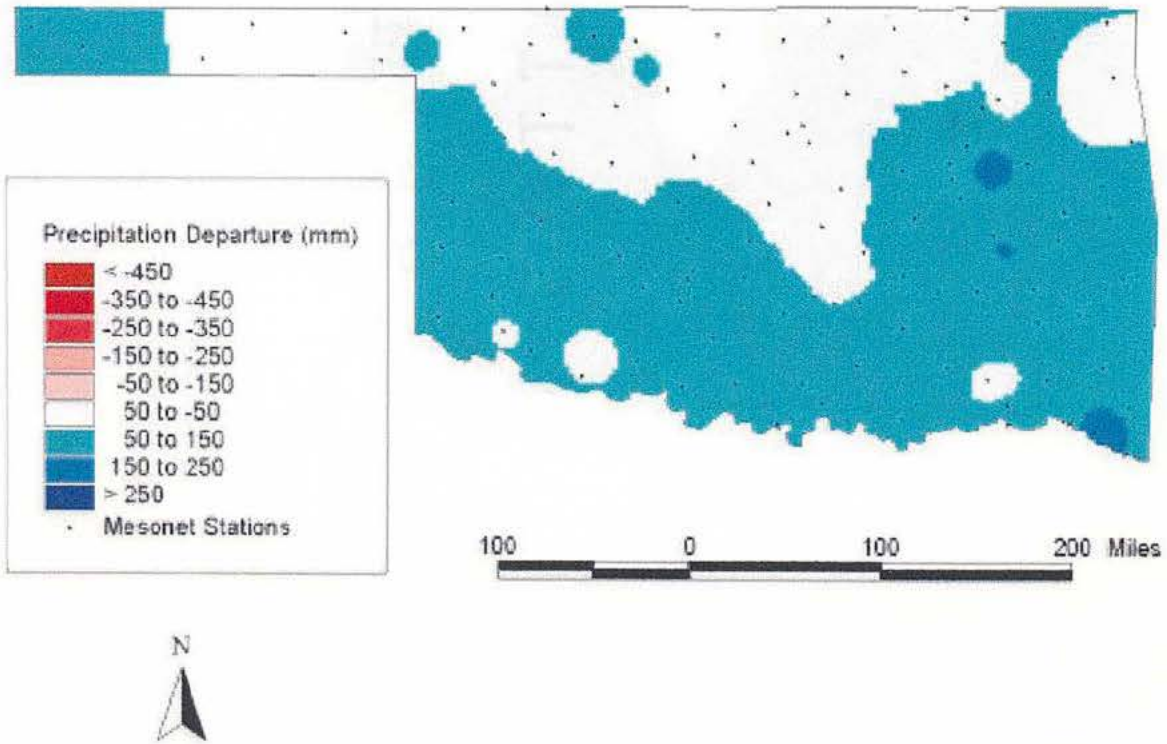
It's mere days later, on July 2, that Governor Keating asked President Clinton to resume using export enhancement funds to boost wheat prices. Soon though the price of wheat wouldn't matter though - there won't be that much to sell.

Deja vu becomes a common feeling as fires depleted precious water stores with no rain in site to replenish them. On, July 7, Mustang used one-third of its water

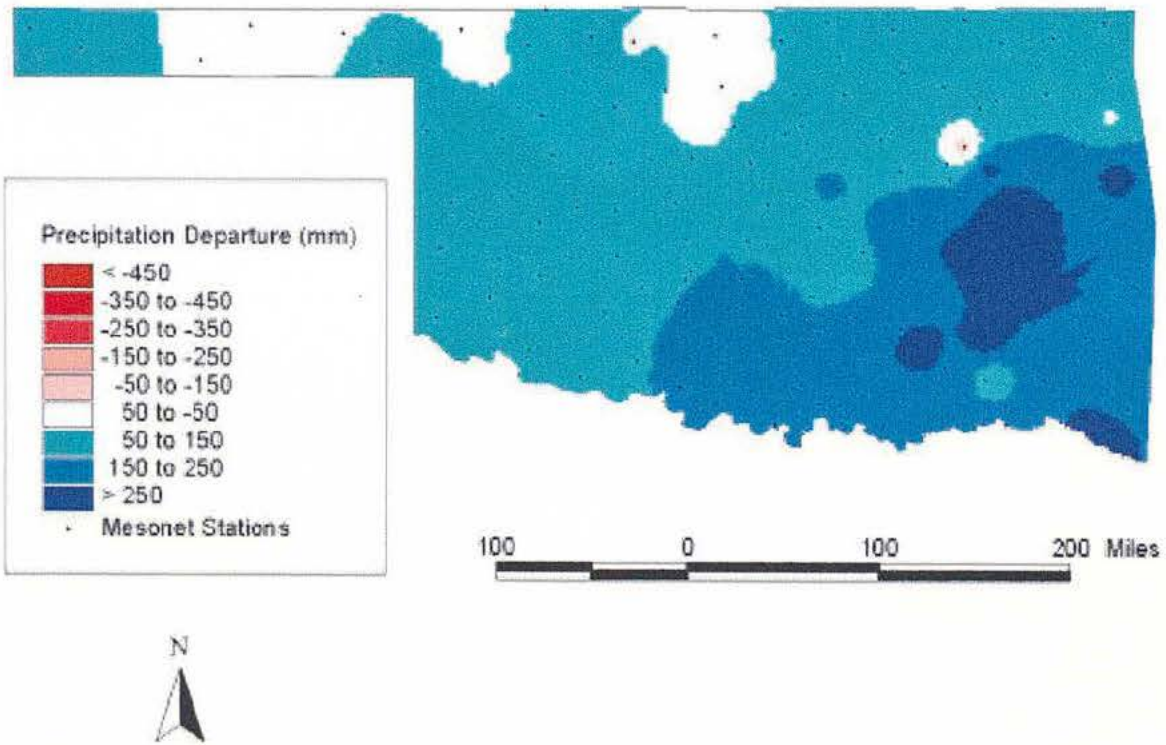
Precipitation Deviation from Normal
1 October 1997 - 30 November 1997



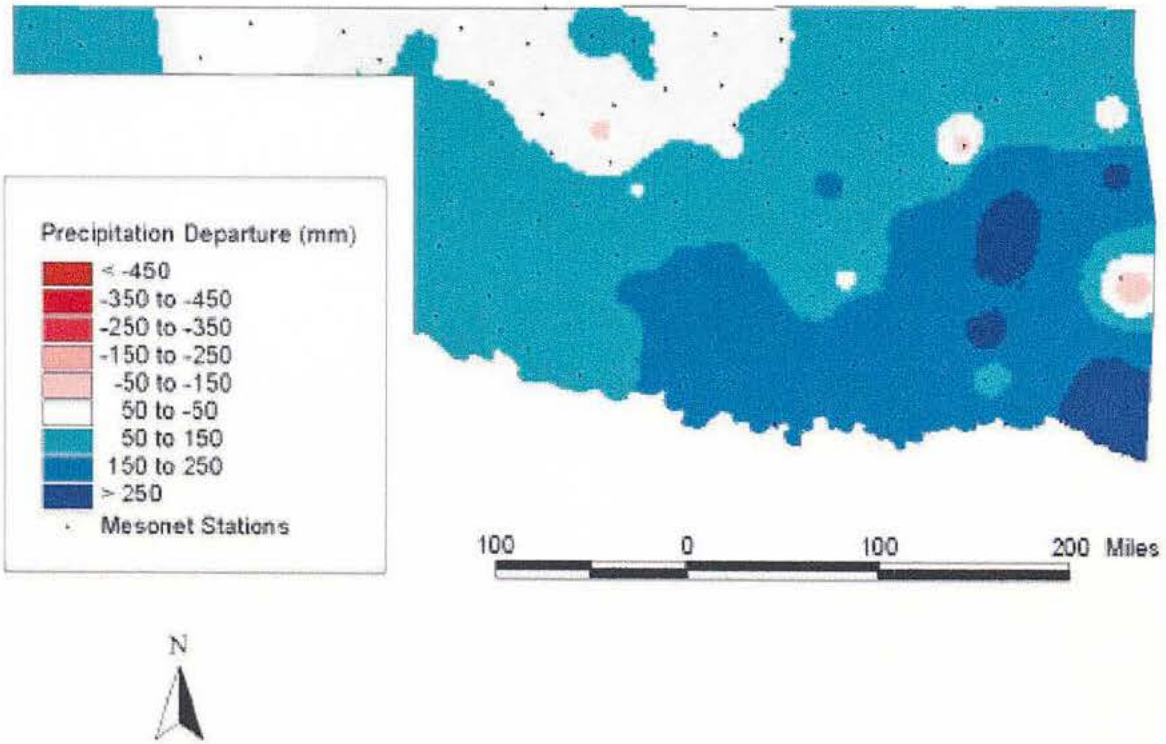
Precipitation Deviation from Normal
1 October 1997 - 31 December 1997



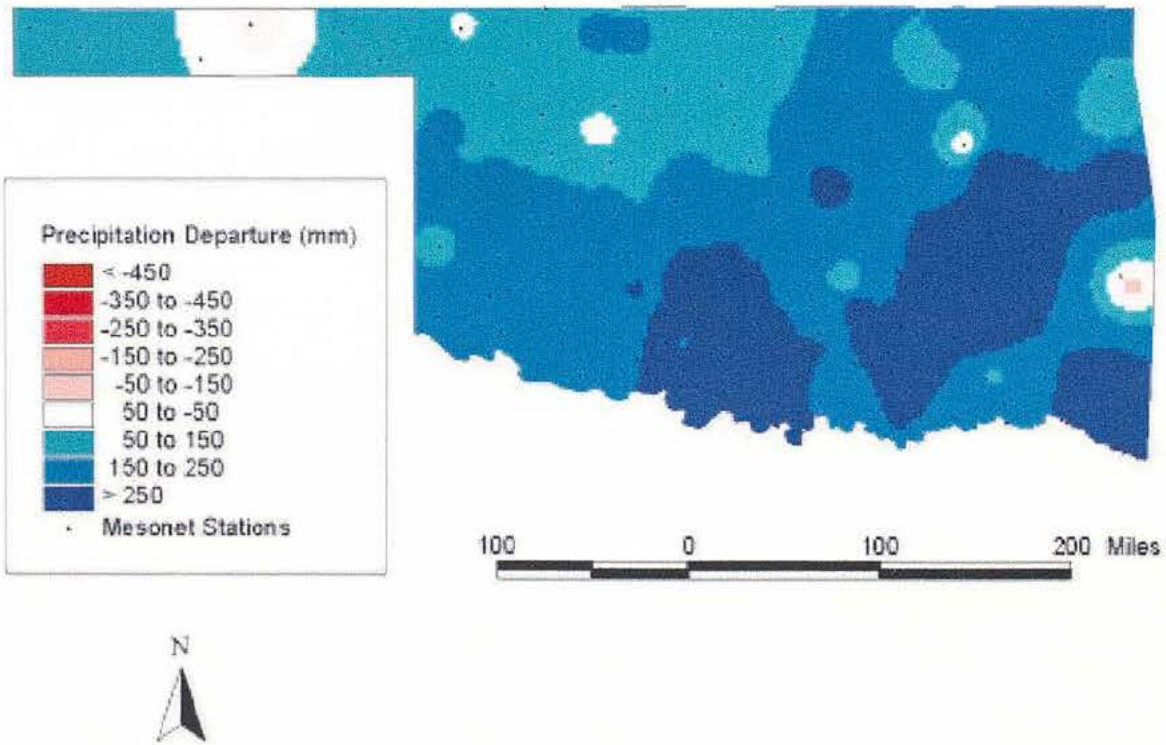
Precipitation Deviation from Normal
1 October 1997 - 31 January 1998



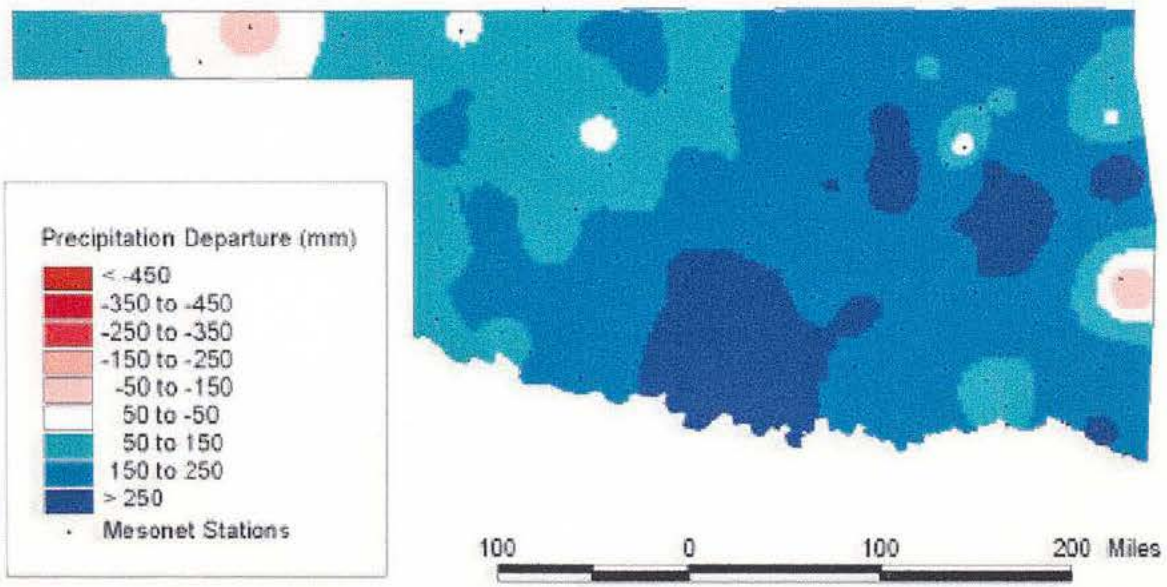
Precipitation Deviation from Normal
1 October 1997 - 28 February 1998



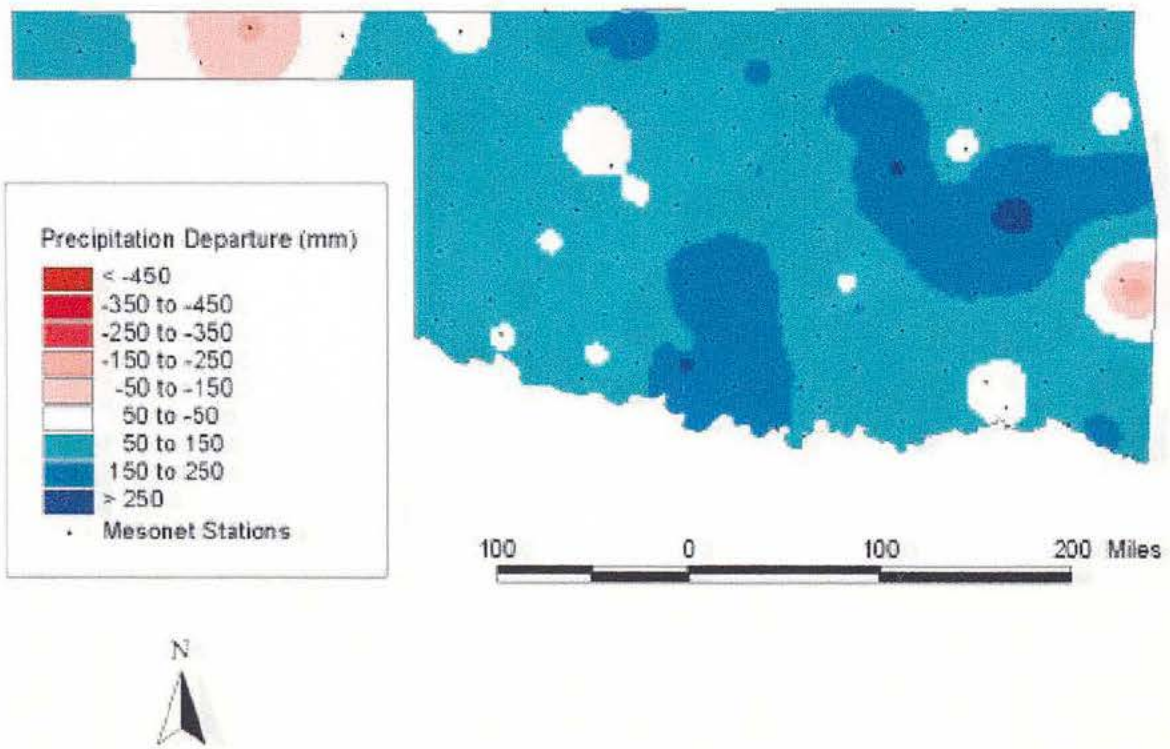
Precipitation Deviation from Normal
1 October 1997 - 31 March 1998



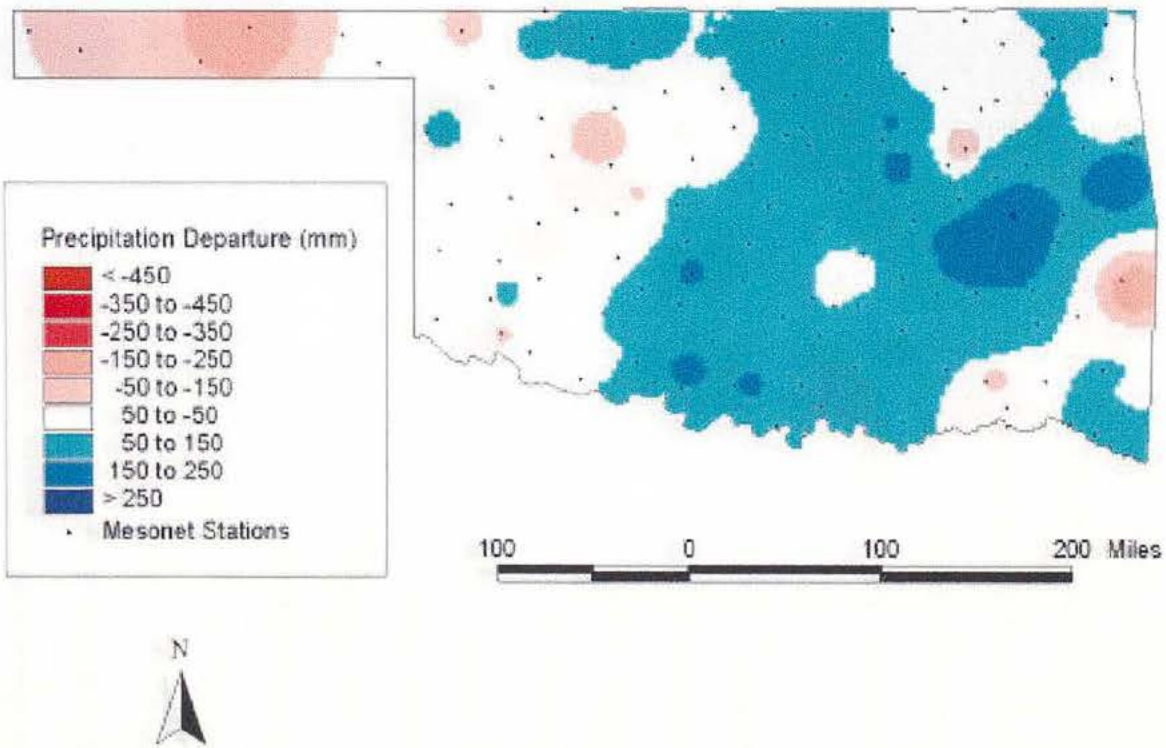
Precipitation Deviation from Normal
1 October 1997 - 30 April 1998

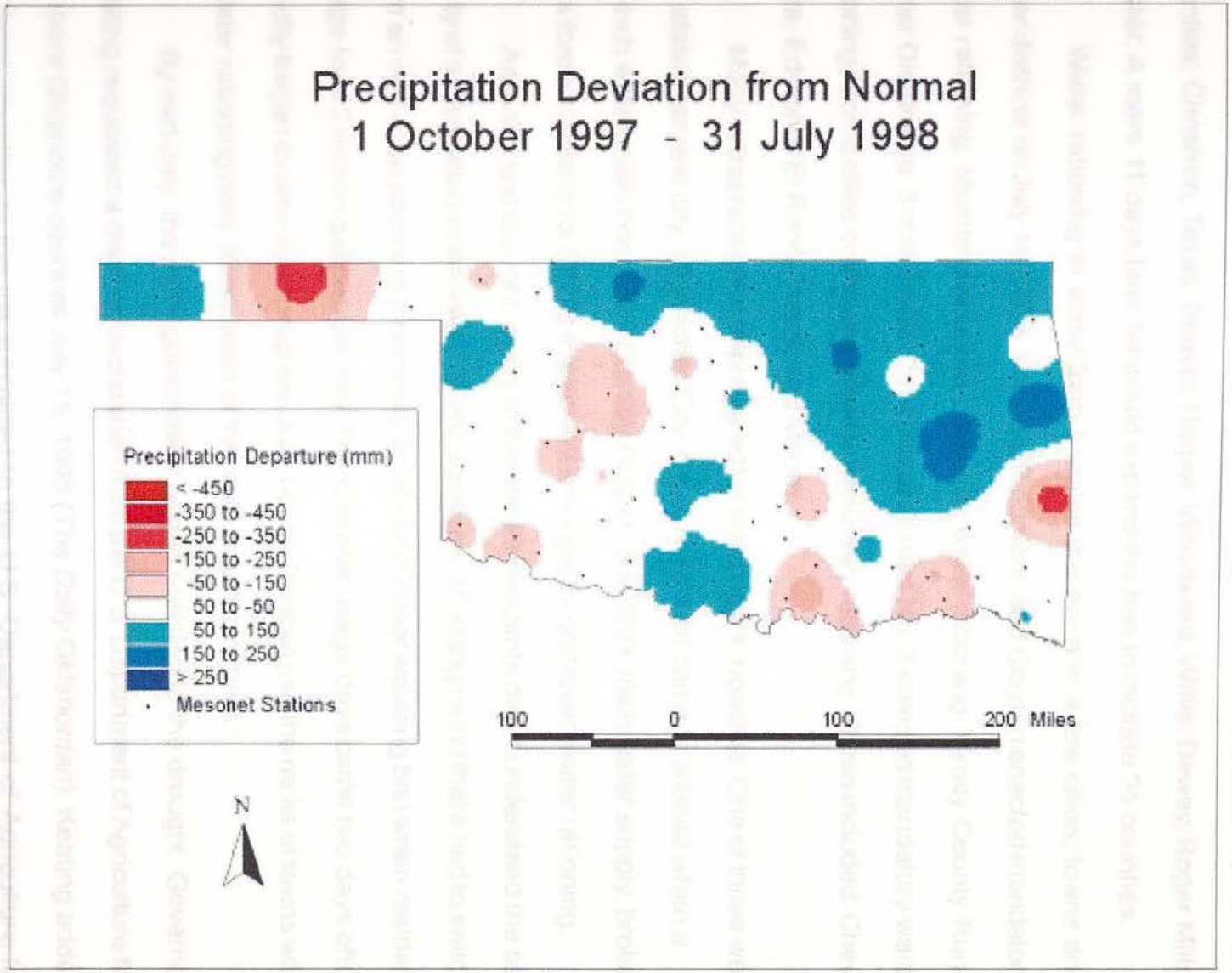


Precipitation Deviation from Normal
1 October 1997 - 31 May 1998



Precipitation Deviation from Normal
1 October 1997 - 30 June 1998




Precipitation Deviation from Normal
1 October 1997 - 31 July 1998
Precipitation Departure (mm)
< -450
-350 to -450
-250 to -350
-150 to -250
-50 to -150
50 to -50
50 to 150
150 to 250
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supply battling an oil tanker explosion; the city purchased 13 million gallons of water from Oklahoma City to keep water supply at a safe levels.

In an optimistic action, July 10 saw the governor lift the burn ban in nine counties: Cimarron, Texas, Beaver, Harper, Woodward, Willis, Dewey, Roger Mills, Custer. A mere 11 days later he would expand the ban to include 35 counties.

Water rationing in some form became the norm in a few cities, towns and water districts on July 11, 1998. Norman, Piedmont, and Clayton enacted mandatory water rationing. Mustang enacted odd-even water rationing. Grady County Rural Water District No. 3 and Bryan Rural Water District No. 2 enacted mandatory water rationing. Some cities and towns relied on voluntary rationing. These included: Cheyenne, Edmond, El Reno, Maud, and Moore.

Many areas remained unprepared for the drought, however. One of these was the state's largest city, Oklahoma City. On July 13 it all came to a head when a 72-inch water main from Lake Stanley Draper , the city's main water supply, broke. This forced Oklahoma City to implement emergency odd-even water rationing.

As in the last drought, many of the state's residents didn't understand the severity of the situation when asked to limit water use. Mustang found that it had to switch from an odd-even rationing program to an all-out outdoor watering ban when resident usage tops 2 million gallons per day. The massive usage days came two days after the city began its odd-even program. July 14 saw Duncan join the ranks of towns with a water rationing plan. Soon, most of the state would join them.

By mid-July, the state government began reacting to the drought. Governor Keating requested a disaster declaration from the U.S. Department of Agriculture for 29 more Oklahoma counties July 15, 1998 (*The Daily Oklahoman*). Keating added 29 more counties to the list submitted to the U.S. Department of Agriculture for disaster designation.

The following day brings visitors from Washington, D.C. Oklahoma Congress-

men met with representatives from the state's major farm organizations to discuss the current situation (*Tulsa World*).

Joining the many cities issuing a water use ban, El Reno imposed a mandatory odd-even water rationing system (*The Daily Oklahoman*).

On July 17, Oklahoma Agriculture Commissioner Dennis Howard reported that the drought has cost state farmers and producers $2 billion (*The Daily Oklahoman*). The searing heat combined with pollution caused Oklahoma City to issue an ozone alert for the day. And somewhat amusingly, although more than 20 cities have implemented water rationing, $2 billion has been lost and the governor has requested disaster declarations for 29 counties the state finds itself merely in an alert stage. The State Civil Emergency Management Department reported that the state is at stage two - alert stage of the Oklahoma Drought Plan (*Tulsa World*).

The drought saw federal action from the legislative body on July 18, 1998. Oklahoma Congressmen proposed that the USDA make advance transition payments to farmers (*The Daily Oklahoman*). The U.S. Senate passed a $500 million emergency funding for farmers suffering repeated hardships (*The Daily Oklahoman*). On the other hand, state response remained lacking. In a repeat action of 1996, Governor Keating again asked religious leaders to hold a day of prayer (*The Daily Oklahoman*).

Though farmers needed assistance, so did ranchers. Many livestock producers had to sell off their cattle in order to survive. OKC West Livestock Market reported weekly sales of 4,000 to 5,000 head per week, compared to the previous year's average of 2,500 per week. Ranchers attributed the increased sales to increased feed costs due to lack of feed grains and water (*The Daily Oklahoman*). To add to the situation, a horde of grasshoppers invaded Oklahoma from the Texas border drawn by the dry weather and searching for food. They find it in parts of Oklahoma by eating what grasses remained and in some cases, even nylon window

screens. Spring rains usually control the grasshopper population because moisture causes immature grasshoppers to develop a fungus and die. If precipitation doesn't occur then spraying insecticide before the grasshoppers mature will control the population. The government at neither the city, county nor state level provided this mitigation (*The Sunday Oklahoman*, July 26, 1998).

The federal government continues to try to create situations that would improve the U.S. agricultural situation. On July 19, President Clinton announced the U.S. government will buy $250 million worth of surplus wheat to donate to foreign countries in need (*Lycos News*).

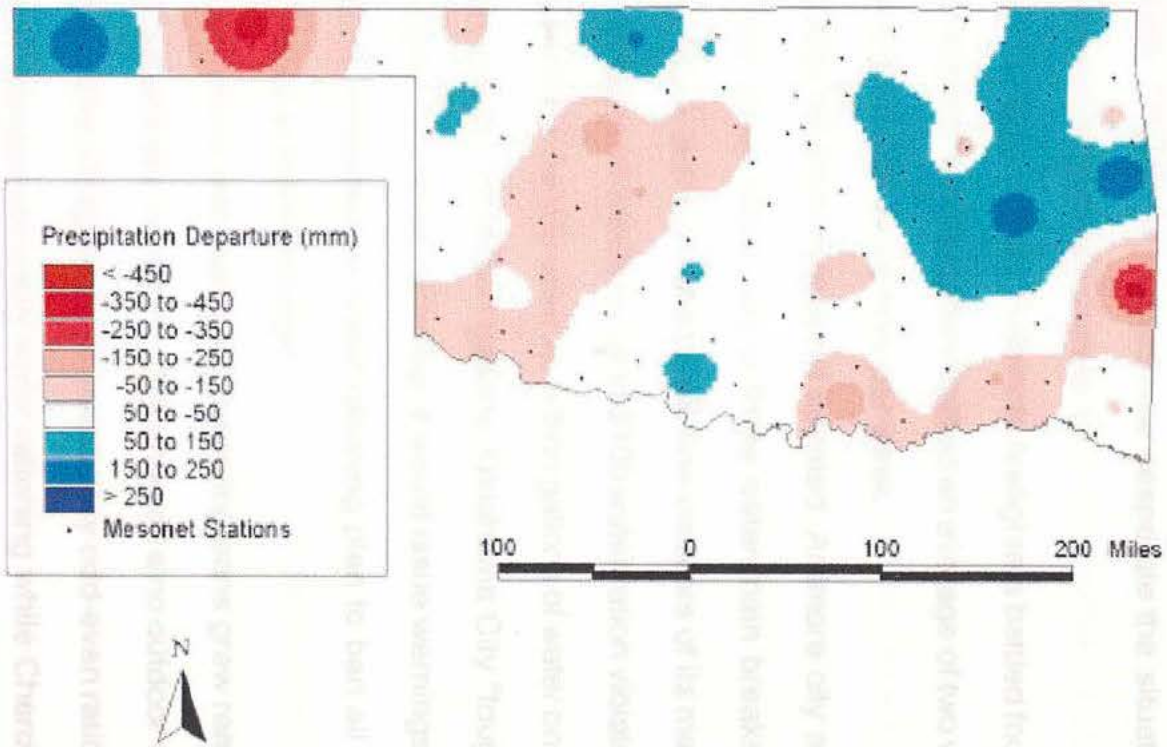
As July drew to a close, agencies begin disaster assessments. Oklahoma Department of Agriculture Wildfire Assessment Teams examined conditions is southern Oklahoma to determine the drought's severity and the need for burn bans. In Cleveland County, the Farm Services Agency estimated a 90 percent agricultural loss in its Disaster Assessment Report (*The Norman Oklahoman,* July 20, 1998).

Though the assessment teams worked throughout the state, the drought is far from over, a fact residents seemed to not grasp. City officials also seemed to find the realities hard to grasp as even mandatory water rationing programs remain unenforced. With no consequences for violations set and enforced, many residents ignored the mandatory rationing. For instance, on July 21, Oklahoma City residents set a consumption record of 166.2 million gallons of water while under a mandatory water rationing plan. The following day, neighboring Edmond enacted mandatory odd-even rationing for outdoor water usage (*The Daily Oklahoman*).

Fire conditions worsened as did the water shortages. July 22 found Governor Keating expanding the state burn ban to 29 additional counties bringing the total number under the ban to 35 (*The Norman Transcript*; Office of Governor Frank Keating).

The state began a service to help ranchers find affordable hay for their cattle. The Oklahoma Department of Agriculture Market Development Services established

Precipitation Deviation from Normal
1 October 1997 - 31 August 1998



a toll-free hay hotline to match hay sellers and buyers.

On July 23, 1998, President Clinton announced $100 million in emergency aid to Oklahoma and 10 other states suffering heat waves. Oklahoma residents needed the assistance. The drought's severity grew daily. The state's largest daily newspaper, *The Daily Oklahoman*, gathered reports from throughout the state for an in-depth story on the drought. The report showed how desperate the situation has become. The drought/heat wave death toll rises to 13.

Wildfires raged throughout the state. Seminole firefighters battled four to five fires daily. In Cromwell and Wetumka firefighters battled an average of two wildfires per week and in Wewoka it's two to three fires per week.

The water availability situation downward spiraled. Ardmore city manager Blaine Hines reported that crews repair two to three water-main breaks a day. Edmond became the first city to publicly report it will fine violators of its mandatory rationing. Violators were threatened with fines up to $100 water ration violators. The catalyst to the fines? Residents of the city used 22 million gallons of water on July 22, exceeding the city's capacity by 1.5 million gallons. Oklahoma City "toughened" enforcement of its mandatory odd-even rationing; it would issue warnings but not tickets for violations. Norman retooled its water rationing plan to ban all outdoor watering on Mondays to allow system recharge.

The list of cities and towns with mandatory watering bans grew remarkably that day. Reno, Mustang, Newcastle, and Union City enacted a no outdoor watering ban. Moore, Piedmont, and The Village enacted mandatory odd-even rationing for outside water uses. Maud enacted voluntary water rationing while Cherokee and Cushing enacted voluntary watering bans. Yukon enacted a two day outside watering ban then returns to mandatory odd-even watering (*The Daily Oklahoman*).

The next day, July 24, the drought/heat wave death toll rose to 15 (*The Daily Oklahoman*). Many older residents, afraid they wouldn't be able to pay the high cool-

ing bills, didn't turn on their air conditioners. Others simply could not afford an air conditioner.

Though water rationing had become prevalent the water availability situation continued to worsen. The city of Lawton began drawing from its secondary water source at Lake Ellsworth due to drain on Lake Lawtonka. Norman banned outdoor watering at municipal facilities and enacted a voluntary ban for institutional customers due to heavy overnight water usage.

Fire also continued to threaten the state. The Department of Agriculture Fire Prevention Task Force met with western Oklahoma fire fighters and officials to determine drought severity. Two days later, the Oklahoma Department of Agriculture's Forestry Services Division expanded the Oklahoma Red Flag Fire Alert to cover 36 of Oklahoma's 77 counties. July's wildfires destroyed more than 2,100 acres of timber and caused losses of more than $5 million in timber, houses and other structures forestry officials report.

On July 25, the U.S. Senate approved $500 million for drought relief. The following day, U.S. Secretary of Agriculture Dan Glickman declared 66 of Oklahoma's 77 counties disaster areas (*The Daily Oklahoman*).

The grasshopper plague continued to invade Oklahoma farms - too mature to be sprayed for, the insects eat every plant they can find. Agricultural scientists recommended that the state invest in research on the vermin this year and spray for them next year before egg hatching occurs. The Oklahoma Agriculture Statistics Service reported 44 percent of Oklahoma pasture rates poor to very poor (*The Daily Oklahoman*).

Oklahoma City set a daily water consumption record on July 27 -171.8 million gallons. The city continued to issue no citations for violations its rationing plan - only warning tickets (*The Daily Oklahoman*).

Late July brought the requisite federal visitors. On the 28th of the month U.S.

Agriculture Secretary Dan Glickman joined the governor in touring three Oklahoma farms affected by the drought. While in Oklahoma, Glickman extended the deadline for emergency grazing on Conservation Reserve Program lands to November 30, 1998. Governor Keating designated August 2-8, 1998 as "Drought and Wildfire Awareness Week." The same day, the state's Drought Management Team met and added three members -the state Department of Human Services, state medical examiner's office and Oklahoma-Arkansas Division of the Salvation Army (*The Daily Oklahoman*).

The following day, as the tour continued, Glickman admitted that the crop insurance programs needed reforms to provide an agricultural safety net (*The Norman Transcript*). He also approved 17 Oklahoma counties' ranchers to produce hay and graze cattle on Conservation Reserve Program lands (*The Dallas Morning News*) but could offer little help for those without CRP lands.

As the drought/heat wave death toll rose to 17 (*The Daily Oklahoman*), the Department of Human Services announced it would begin taking applications on August 3 for $4.3 million in emergency aid to pay for air conditioners, fans and electricity bills (*The Norman Transcript*).

The state Agriculture office's hay hotline had put many ranchers in touch with hay sellers but the cost of transporting the hay put the cost of feeding cattle out of bounds for many ranchers. To remedy this problem, State Rep. Mike Mass of Hartshorne, requested that Gov. Keating activate the National guard to transport hay to agricultural producers (*The Norman Transcript*).

The downward spiral of water availability continued as the state's residents continued to violate their cities' bans. Two towns- Yukon and El Reno- join Edmond in assessing fines for violations. Those violating Yukon's ban would pay $100 fines. Those violating El Reno's ban would pay $35 fines (*The Daily Oklahoman*).

Other cities still hadn't reached this point. Norman "toughened" its rationing

plan and began issuing warning tickets (*The Daily Oklahoman*).

Smaller towns then began joining the ranks of those with bans.

The towns of Kingston, McLoud, Minco, and Pittsburg county enacted mandatory no outside watering (*The Daily Oklahoman*). Newcastle enacted mandatory no lawn watering, while Nowata enacted mandatory water rationing. Duncan and Edmond enacted mandatory odd-even rationing for outdoor watering. Moore, The Village, Woodward, Yukon Okeene, Pauls Valley, Piedmont, and Seminole enacted mandatory odd-even rationing. Mustang enacted mandatory rationing and no outside watering except on an odd-even basis between midnight and noon. Union City enacted mandatory rationing with limited odd-even outdoor watering. Wilburton enacted mandatory water conservation (*The Daily Oklahoman*).

The towns of Adamson, Cheyenne, and Latimer county enacted voluntary water conservation. Grady county enacted voluntary no outside watering while Maud enacted voluntary water rationing. Pushmataha county enacted voluntary rationing. Bryan county enacted mandatory no lawn watering, as do the towns of Centrahoma, Clarita-Olney, Coalgate, Clayton. Laverne enacted precautionary rationing (no outside watering) from 2 p.m. to 8 p.m. (*The Daily Oklahoman*).

Broken Bow's mayor declared a limited fire emergency due to two wildfires in the Broken Bow area - one of 1,000 acres, the other of 2,000 acres (*The Norman Transcript*). U.S. Forest Service dropped flame retardant on both fires but they continued to burn throughout the night. The following day, July 30, Broken Bow closed its airport to accommodate firefighting efforts only (*The Daily Oklahoman*).

Answering State Rep. Mike Mass' request on July 30, 1998, Gov. Keating activated the National Guard to deliver hay to agricultural producers (*The Norman Transcript*). He also added 13 counties to the 35 already under a mandatory burn ban (*The Dallas Morning News*). As Oklahoma City logs its 12th day in a row of 100 degree or above heat , Gov. Keating sent letters to the governors of Missouri,

Kansas, Arkansas and Colorado looking for partners in the fight against the drought (*The Daily Oklahoman*).

By now the Broken Bow area had 200 firefighters from the U.S. Forest service, state Department of Agriculture's Forestry service, the Bureau of Indian Affairs and volunteer fire departments battling the infernos (*The Daily Oklahoman*).

The last day of July saw no end to the fires. The U.S. Forest Service added 120 firefighters to the wildfire force in Broken Bow, including a Hot Shot crew from Pleasant Valley, Arizona (*Tulsa World*). Fire crews had trouble getting equipment to the fires though, due to traffic jams caused by concerned citizens. Traffic worsened when officials were forced to evacuate campers at Beaver Bend Resort in Broken Bow as six fires burned the area (*The Daily Oklahoman*). Broken Bow reports 7,800 acres of timberland destroyed by the two wildfires that began on July 29th. July 1998 broke and doubled the previous record of 5,000 acres for acres burned during July (*The Sunday Oklahoman*). Governor Keating declared a state of emergency and announces creation of a World Wide Web site with Oklahoma drought information.

Residents continued to overuse water and violate rationing bans. To combat this, city leaders of Oklahoma City, Edmond, Norman, Mustang, Piedmont, and El Reno convened the Emergency Water Summit to educate citizens about the need to conserve water (*The Daily Oklahoman*).

At the federal level, U.S. Agriculture Secretary Dan Glickman told the U.S. House Agriculture Committee that the proposed $500 million in drought aid will not suffice. Congress either must come up with more funds or eligibility for them must be tightened, he said (*The Daily Oklahoman*).

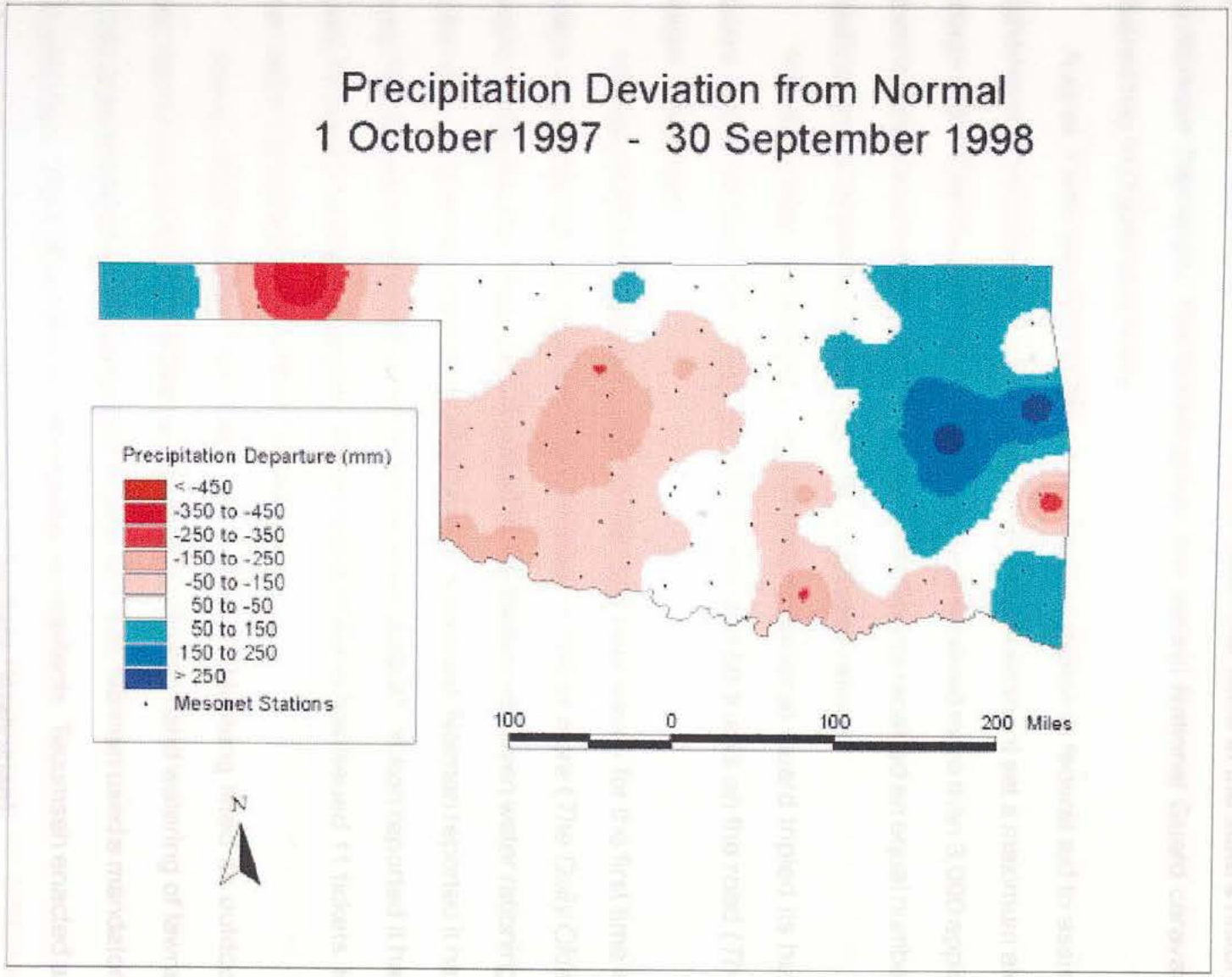
Meanwhile, Feed the Children organized a prayer schedule for Oklahomans to pray for rain (*The Daily Oklahoman*). The following day, August 1, desperate farmers cut the soybean crop early to use as cattle feed (*The Daily Oklahoman*).

The Broken Bow fire complex continued to grow. Officials reported 12 to 15 new fires in and around the Ouachita National Forest (*The Daily Oklahoman*). The fire response then included three Oklahoma National Guard helicopters, American Indian and U.S. federal fire crews, the Oklahoma Wildlife Conservation Department, Oklahoma Highway Patrol, state fire marshal's office, the Idabel police and firefighters from Arkansas, Mississippi, Nevada, California, Colorado, Minnesota and the Cherokee, Chickasaw, Creek, Comanche and Kiowa nations (*The Daily Oklahoman*). The Oklahoma Forestry Association offered a $50,000 reward for information leading to the arrest and convictions of the arsonist(s) suspected of setting the fires (*The Norman Transcript*).

August 2, 1998 marked the first day of Drought and Wildfire Awareness Week. Before the honorary week ended Oklahoma would lose more than 10,000 acres of land to fire, causing more than half a million dollars in damages (Oklahoma Drought Management Team). The Beavers Bend fires resulted in a large portion of that acreage. The Bend fire complex destroyed one home and approximately 5,800 acres of timberland (*The Norman Transcript*). Officials allowed tourists evacuated from Beavers Bend Resort (Ouachita National Forest) to return to reclaim their belongings.

Firefighting, overuse, and misuse of water quickly sapped the state's reserves. In one of the most publicized water abuse incidents, the Duncan Golf and Country Club received a fine of $1,000 for illegally filling its ponds from an unmetered fire hydrant. In another example of water shortage severity, Altus Lake fell 13 feet exposing foundations from the town of Lugart, submerged years before to form the lake (*The Sunday Oklahoman*).

The state however, had more luck addressing the hay shortage. Chickasaw Nation trucks completed the 48-hour round-trip to Illinois and back to Oklahoma to deliver hay (*The Sunday Oklahoman*). Local Farm Service agencies began distribut-


Precipitation Deviation from Normal
1 October 1997 - 30 September 1998
Precipitation Departure (mm)
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ing the donated hay to drought-affected farmers and ranchers (*The Norman Transcript*). Their workday is anything but enjoyable though as temperatures topped 100 degrees for the 16th day in a row, the third longest heat wave in the state's history (*The Norman Transcript*). The following day, the second National Guard caravan delivered hay to Durant and Atoka.

August 3 also saw applications open for $3.4 million in federal aid to assist Oklahomans in homes with no air conditioning. The government set a maximum aid package of $150 per household. Oklahoma County received more than 3,000 applications before the close of the business day; Tulsa County received an equal number of applications; Comanche County received 2,000 applications.

Two days later, on August 5, the Oklahoma National Guard tripled its hay delivery efforts, putting 100 troops on active duty and 50 trucks on the road (*The Norman Transcript*).

The day marked Oklahoma's first break in its heat wave - for the first time in 49 days no Oklahoma city reported a temperature of 100 or more (*The Daily Oklahoman*). Optimistically, Oklahoma City lifted its mandatory odd-even water rationing; it is the only city to do so (*The Daily Oklahoman*). In contrast, Norman reported it has issued 100 tickets to water rationing violators since June 27. Yukon reported it has issued 78 tickets to water rationing violators and El Reno has issued 11 tickets to water rationing violators (*The Daily Oklahoman*).

Some areas modified their bans. On August 7, Mustang lifted its outdoor water ban to allow odd-even watering. Newcastle allowed hand watering of lawns. Nichols Hills limited outdoor watering to 10 p.m. to 7 a.m. Norman used a mandatory odd-even ban. Other areas though get tougher on residents. Tecumseh enacted an outdoor lawn watering ban, as did Union City(*The Daily Oklahoman*).

The Plains States Rural Crisis Summit convened on August 7 with agricultural representatives from 16 states. The summit resulted in 22 recommendations to Con-

gress (*The Daily Oklahoman,* August 8).

While the politicians meet, wildfires continued to burn across the state. The Forest Service reported 54 fires destroyed more than 10,000 acres since July 29 (*The Sunday Oklahoman*).

Two days later, as fires continued to burn in the Ouachita National Forest, the public school in Broken Bow became the Incident Command Post. The Red Cross provided bottled water and sack lunches for the 284 firefighters from 18 states and five Native American nations who continued to battle the blazes that just wouldn't quit. In addition to firefighters, more than 40 personnel from county, state and federal law enforcement agencies investigated the fires.

On August 10, a group of state senators took a helicopter tour of the forest lands destroyed by 61 fires since July 29. Like 1996, officials suspected arson in many of the blazes. The following day, the Federal Bureau of Investigations, and the Federal Bureau of Alcohol, Tobacco and Firearms joined the fire marshal's office in investigating the fire that destroyed Bethel Camp Israel Folsom, a church near Bethel, OK (*The Daily Oklahoman*).

On August 11, the National Farmers Union launched a campaign to have federal loan rate caps removed (*National Farmers Union News*).

President Clinton signed legislation that makes available $5.5 billion of aid to farmers on August 12 (*Tulsa World*).

The drought underscored the lack of water distribution systems in rural Oklahoma. In Daisy it became common for more than ten families to share one water well.

On August 13, the USDA released Oklahoma crop forecasts for 1998 harvests. Cotton production fell 40 percent from 1997, the lowest production since 1895. Grain sorghum production fell 29 percent from 1997. Peanut production fell 11 percent from 1997. All hay production fell 27 percent from 1997 (*The Daily Oklaho-*

man).

In other agricultural actions, Gov. Frank Keating signed rules to implement a program to help farmers and ranchers build or rehabilitate ponds (*The Norman Transcript*). Implementation of the program was quick. Local conservation offices began accepting applications for the pond building program on August 17 (*The Norman Transcript*, August 13).

On August 15, President Clinton released an additional $50 million in emergency aid funds to drought affected states. Oklahoma received $2.3 million of the new funds (*The Norman Transcript*).

In late August the USDA borrowed a mitigation idea from Oklahoma. On August 19, 1999, it launched Hay Net, a national clearinghouse to match farmers and ranchers with hay with those in need of hay using the existing staff, offices, and computers of the USDA's Farm Service Agency.

Oklahoma's Operation Haymaker realized the need to expand. The hay delivery program added private truckers to National Guard deployment to keep up with demand. The following day, Operation Haymaker released a September 11 deadline for producers who wanted their hay delivered under the program (*The Norman Transcript*). On August 22, Central Oklahoma Vo-Tech instructors joined the Operation Haymaker transportation team (*Tulsa World*). The same day Oklahoma Civil Emergency Management announced that a program to pay private truck operators would not be ready until August 24, 1999 (*Tulsa World*).

The state temporarily suspended cloud seeding activities in the northwest and Panhandle regions of Oklahoma on August 27 (State of Oklahoma Water Resources Board). The chance of rain in some areas looked positive.

Farmers received disheartening news on the 30th of the month. The state average wheat price fell to $2.14 per bushel, the first time the price fell below $2.20 since 1986 (*The Sunday Oklahoman*). By the end of the first week in September, the

price fell further. By September 8, in some parts of the state wheat prices dropped below $2 per bushel (*The Daily Oklahoman*). On September 13, the state Department of Agriculture estimated that drought and falling prices will drive 25 percent to 30 percent of Oklahoma farmers and ranchers out business this year (*The Norman Transcript*).

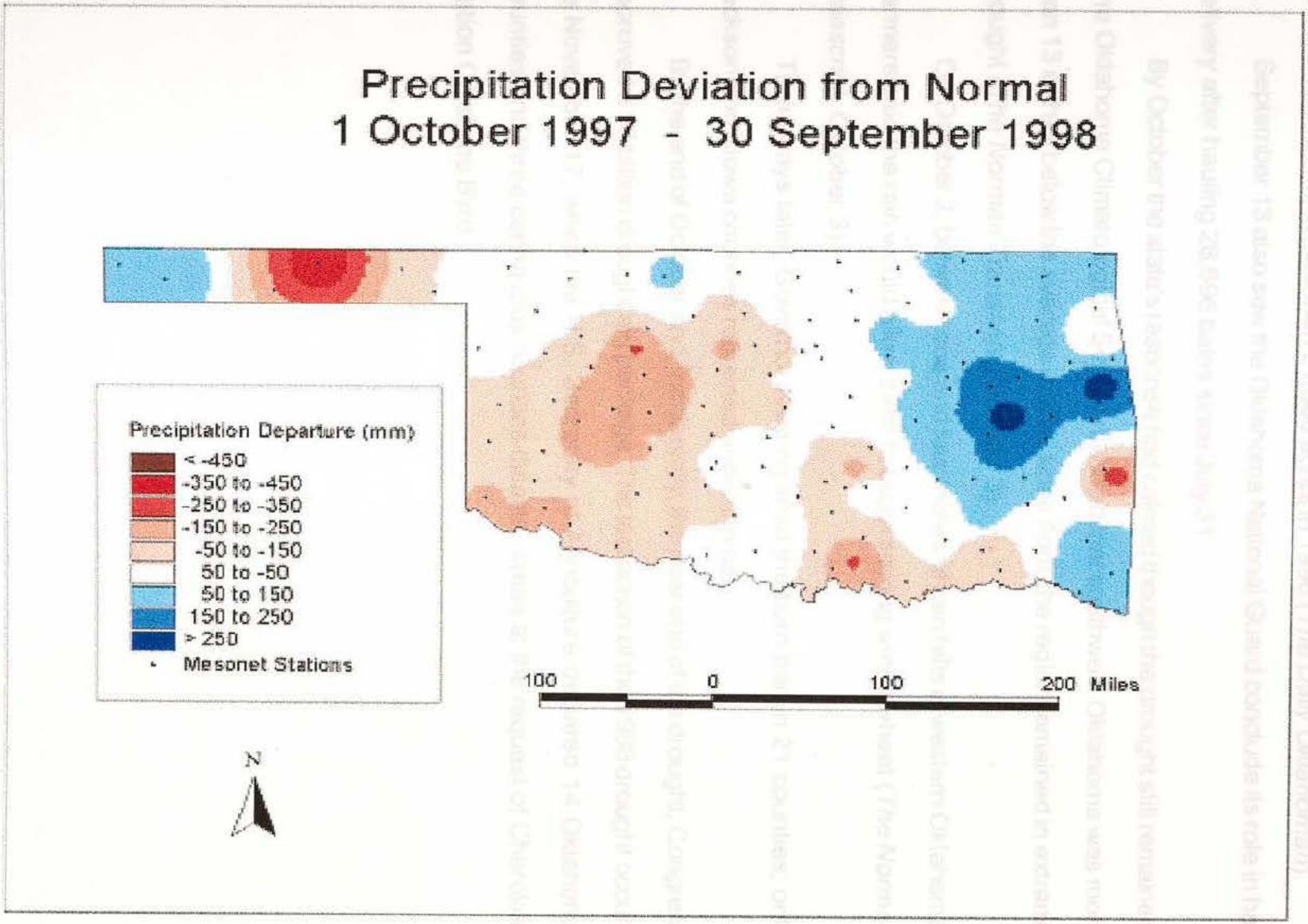
September opened with a return to the heat wave the state had experienced in the earlier summer. The temperature hit or exceeded 100 degrees in more than 25 cities and towns in Oklahoma.

On September 2, Governor Keating modified the mandatory burn ban in 44 Oklahoma counties to allow local fire officials to authorize controlled field/pasture burning. The process was the only way to prepare the stubbled fields for planting (Office of the Governor).

By September 3 the drought/heat wave death toll rose to 21, the state Medical Examiner's office reports (*The Oklahoma Daily*). Deaths from heat exposure continued to occur, as many older residents still can not afford to run air conditioning. The limit of the federal aid, $150 will only cover one month of an Oklahoma drought electric bill.

As in 1996, when the rain does come, the ground nor the state were ready for it. Rains on September 15, brought minor flooding on the Neosho River near Commerce. Officials predicted moderate flooding of farms and pastures from the Kansas border to the headwaters of Grand Lake by the next morning. The following day the National Weather Service issued flash flood warnings for Choctaw, Pushmataha, Le Flore and McCurtain counties (*The Daily Oklahoman*).

State Forestry officials recommended that Governor Keating remove 28 eastern counties from the mandatory burn ban but fire danger remained high in western Oklahoma which did not receive rain. 36 counties remained under the ban. A little more than a week later, on September 23, the governor lifted the burn ban in 13 more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counties. The final report on the Broken Bow fire complex found that the area suffered 735 fires that burned more than 21,000 acres in 1998 (*The Daily Oklahoman*).

September 13 also saw the Oklahoma National Guard conclude its role in hay delivery after hauling 26,696 bales since July 31.

By October the state's response had calmed though the drought still remained. The Oklahoma Climatological Survey reported that southwest Oklahoma was more than 13 inches below the average rainfall since April; the region remained in extreme drought (*The Norman Transcript*, October 3).

On October 2, between one and four inches of rain falls in western Oklahoma. Farmers said the rain would allow them to begin sowing winter wheat (*The Norman Transcript*, October 3).

Three days later, Governor Keating lifted the burn ban in 21 counties; only Jackson and Kiowa counties remained under the ban.

By the end of October and, incidentally, the near end of the drought, Congress approved a $6 billion drought aid package. The last action of the 1998 drought occurs on November 17, when the U.S. Secretary of Agriculture declared 14 Oklahoma counties and three contiguous counties disaster areas at the request of Cherokee Nation Chief Joe Byrd.

Chapter 5
Alternate Planning and Mitigation Solutions

In any relationship, communication is key. This includes not only speaking with one another but actively listening. The federal and state government had a problem with true communication throughout the droughts of 1996 and 1998. This problem still stands unaddressed, and uncorrected. During the three-year period of time, agricultural producers, fire officials, and the community at-large told the government, at multiple levels, what mitigation needs existed. In most cases, rather than addressing the problems presented by using the requested solutions, the government stuck to its old, tired mitigation solutions which have been shown to fail in the past and continue to fail.

What, you may ask, is my definition of failure? The loss of 6 lives in the 1996 drought. The loss of 17 lives in the 1998 drought. The loss of 54 homes in the 1996 drought. The loss of 4 homes in the 1998 drought. The loss of more than 600,000 acres to wildfire in the 1996 drought. The loss of more than 25,000 acres to wildfire in the 1998 drought. The lesser figures for 1998 in the areas of homes burned and acreage lost were not so much a function of mitigation techniques but of the shortness of the drought and the areas in which fires occurred.

Communication- one of the keys to successful learning- is a key not on the chain of command of drought mitigation in Oklahoma. Starting with the fact that the agencies enumerated in the drought plan sometimes had no inkling that they were indeed a part of the mitigation effort and ending with the fact that the needs of the people directly affected by the drought were ignored, the government has yet to learn to communicate effectively.

The government at all levels needs to revamp its mitigation techniques. Its outdated, homespun methods of mitigating drought have seen their best days. On virtually ever topic related to drought mitigation the government lags behind the cutting edge of technology, research and development. From the state's poorly assembled drought plan and the federal government's lack of one to the inability of agricultural producers to conduct business using modern risk management techniques, drought

planning and mitigation in Oklahoma and the United States must undergo a major overhaul if we expect to thrive as a nation.

Drought Plan

The most basic need of a mitigation effort is a plan. Without a plan, response proceeds in an uncoordinated, crisis-responsive manner. When Tom Feuerborn, director of the state Department of Civil Emergency Management, introduced the new drought plan he described it as a new era in state response.

"It's the first time in Oklahoma that we have a coordinated plan where all of the agencies know the responsibilities of the other agencies, including the federal government," he said (*The Norman Transcript*, August 5, 1997).

That statement was misleading as some agencies didn't even know they were included in this "coordinated" plan. For instance, when an University of Oklahoma drought research team requested the Internal Revenue Service in Oklahoma City complete a survey concerning the 1995-96 and 1998 droughts, the agency's official reply was that it did not participate in any way in drought mitigation. Its representative did not understand why the team contacted the agency (private correspondence, June 2000).

However, the agency does indeed offer the mitigation response suggested in the plan. It does so, however, as a matter of federal law (Standard Federal Tax Reports, 2000(8) CCH, Code 451 (f)(2)(A)(i) P 21,002 subparagraph e). The I.R.S. offers the *special rule for proceeds from livestock sold on account of drought, flood, or other related conditions* at all times as a part of the federal tax law. Each farmer who meets the requirements of the law can apply it in filing taxes. The I.R.S. explains the provision in its publication, "Farmer's Tax Guide," which receives annual updates (Internal Revenue Service Publication 225, 1999).

Other agencies the plan lists do not exist in Oklahoma or exist in a limited capacity. For instance, the plan recommends farmers contact their USDA county

boards. They would, quite assuredly, if those still existed in Oklahoma. Two counties have active county boards. The other counties have not had active boards for more than 20 years.

Finally, as many citizens pointed out, the government's response was anything but timely. As of July 17, 1998 the state was only in stage two of its drought plan, the alert stage, though at least six people's deaths had already been attributed to the drought/heat wave and the governor had requested that the U.S. Department of Agriculture declare 60 of Oklahoma's 77 counties agricultural disaster areas. Stage two is defined as a mild drought which only requires the drought management team and government agencies to monitor trends (*Tulsa World*, July 17, 1998).

The state government needs to immediately revisit its drought plan, revamping it with additional research and developing it with creative, new approaches to mitigation. The plan needs to address more than the actions existing agencies already take. It must empower one individual/agency with the ability to direct mitigation and order action. Simple suggestion will not get the job done.

Problems with the drought team created by Executive Order 96-24 include that it does not provide any dedicated personnel to mitigate drought. Additionally, the team has no real decision making power. It may "provide coordination and communication," perform assessments, and "develop and *recommend* (emphasis added) state drought response" but can not create a policy to which agencies must adhere.

Update of the drought plan must occur annually in order to approach keeping pace with changes in federal, state and local laws. The government must legally require this.

At the local/regional level, the state needs to implement changes as Texas has to its water management. Texas created a Water Development Board which divided groups of counties into regional water planning groups. Each of these groups must author its own water plan which functions in concert with the state plan. These plans

control water use and allocation in all situations.

Next, to echo Wilhite, the federal government needs to author a detailed, written drought plan of its own that legally mandates all aspects of drought mitigation. It must empower one individual/agency with the ability to direct mitigation **and order action.** In this case, the choice should echo that of Oklahoma's directorial agency, therefore the Federal Emergency Management Agency would direct federal efforts. The mandate for this actually exists currently. Founded in 1979, the agency's mission "to reduce loss of life and property and protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery" perfectly fits the drought situation. The independent agency reports directly to the President. It currently mitigates every natural disaster in the United States, except drought. This means that it mitigates effects caused by the drought such as wildfires, as well as after effects, such as floods.

FEMA's director James Lee Witt says, "FEMA, works to reduce risks, strengthen support systems and help people and their communities prepare for and cope with disasters *regardless of the cause* (emphasis added) (FEMA, 2000)."

The agency has shown reluctance in the past to take on drought but it must do so now. It alone, among the agencies of the federal government has the power , the mitigatory knowledge and the resources to direct a successful response.

Finally, the government needs to update its indicators for predicting and declaring droughts. First, in the area of prediction, recent work in the area of solar activity's influence on El Nino, La Nina and drought cycles, specifically Hale cycle theory, has improved our abilities of prediction to exceed two years (see generally, Landscheidt, 1998 and Niroma, 1996). Landscheidt uses a modeling technique that combines sunspot data, historical El Nino/La Nina data, and Southern Oscillation Index (SOI) data. The government must invest in research in the modeling and pre-

dicting areas, giving special credence to the development of models that can give accurate predictions with a more than one to two year lead time. These models must then be translated into easily understandable and disseminated reports that the average citizen can understand. This allows the government and citizens, such as agricultural producers to ready themselves for the possibility of a drought during, for instance, the burning season or planting season.

Advances in geophysics and engineering have brought about the development of neural networks that can accurately forecast water availability. Eric Zhang and Paul Trimble (1996) showed significant success with such a network in a case study of Florida's Lake Okeechobee, the second largest freshwater lake within the United States. The lake functions not only as a natural ecosystem but the primary source of supplemental water supply for more than 500,000 acres of intensely farmed agricultural land, as well as a backup source of drinking water for Florida's southern urban areas. Florida's intensely variable weather make it a viable comparative to Oklahoma.

Zhang and Trimble combined SOI data, solar sunspot number and geomagnetic activity as inputs for the neural network. The network predicted the largest and smallest inflow months of the testing periods (the dry period of September 1988 to May 1990 and the extremely wet 1994).

By investing in the implementation of neural networks such as these that the government could provide simple, understandable reports to agricultural producers that would allow them to plan for water needs on an annual or better basis.

By implementing the above actions the government at the state and federal levels will establish the needed drought mitigation infrastructure. The remainder of this chapter addresses specific areas that state government needs to target in order to update its plan.

Water Rationing

The government's lack of strength in enforcing mitigatory efforts hurt its influence with the general public. The government's use of voluntary water conservation and of mandatory yet unenforced outdoor watering bans failed to curb water use sufficiently. Many smaller towns in Oklahoma continued to use voluntary water rationing instead of a mandatory system even in the worst stages of the drought (*The Norman Oklahoman*, July 31, 1998). The general public balks at conserving water especially through outdoor watering bans.

Each city and town needs to set reasonable tiered levels to its water rationing. A drought in its fifth month should not see a city still in voluntary rationing. Mandatory conservation needs to occur much earlier in the mitigation effort.

Though some local officials recognized that the public would not adhere to the bans unless strict enforcements were implemented, the instances of city and municipal governments following this expect advice were few and far between. Aggressive enforcement of rationing plans is the best way to make sure residents adhere to water rationing, said Norman Fire Chief John Dutch.

"Without enforcement, no rationing plan can be effective," he said (*The Norman Oklahoman*, July 31, 1998).

As established in the preceding chapter, most cities and towns did not enforce rationing with fines. To insure adequate water remains available for uses such as fire fighting and medical purposes each city or town should issue fines for violations as soon as it makes the move to a mandatory ban.

Without this strict enforcement present, the effects were devastating. For instance, in Norman, water shortages caused health hazards because the water pressure was too low to run medical equipment such as dialysis machines.

Though, as shown in the previous historical discussion, most towns and cities continued to use unenforced rationing and to underestimate water shortages, a few

cities experienced single-loop learning. For instance, the city of Norman switched from unenforced mandatory rationing to enforced rationing in August 1998. Norman also refused to consider the first rainfall to dent the drought as the break of the drought. The city continued its water rationing. Recall that in the 1995-96 drought, officials eager to see an end to the drought twice declared its premature end, first following a heavy mid-December snow in 1995 and the second in mid-March 1996.

"Until we're certain of a sustained weather change, we will continue with the rationing plan," said Todd Jenson, assistant to the city manager (*The Norman Transcript*, September 17, 1998).

There needs to be a standing law that when in a drought, rationing is implemented statewide with specific limitations, regulations and consequences. Leaving it to a town by town basis jeopardizes fire fighting efforts, as well as, shared water sources.

Fire Danger

The public's lack of understanding of the seriousness of the situation extended from water to fire.

"The people... don't seem to recognize that there are fires at their back doors," said Bud Rotroff, team leader of the North Texas Fire Prevention Team. "Their homes and possessions are at serious risk (*The Dallas Morning News*, August 3, 1998)."

But the government's lack of public education program provided an obvious reason for the public's lack of understanding. Rather than focus on the threat of wildfires when the drought began, the state ignored public education until it was too late and fires burned. This occurred in both the 1996 and 1998 droughts, though in different ways. In 1996, the state attempted no significant public education effort while in 1998, the governor declared the week of August 2-8 Drought and Wildfire Awareness Week. Neither effort included actions that would reach every home such as a mass mailing to citizens' homes or inserts in local newspapers.

It generally falls to the media in the state to educate the public though they are without expertise in fire prevention. One in-depth feature story in a single newspaper will not reach every home however.

State and local government authorities must spearhead the public education effort. This means an annual education program beginning just prior to and continuing during the traditional burning season, that includes in-home delivery of printed materials that explain at home mitigation efforts an individual can implement, as well as suggestions for travel. This mailing should function as a stand alone product that provides basic prevention techniques. The government should also offer additional documentation on the Internet. The state should make an additional effort to educate the public of the free Internet access afforded them at most public libraries in the state so that those individuals without in-home Internet access can view the information if desired.

If public education wasn't in the budget, neither was direct mitigation. Pat McDowell, assistant director of the state Agriculture Department's forestry division explained that Oklahoma lacks necessary fire fighting equipment such as helicopters, air tankers and large bulldozers.

"This wasn't in our budget," he said (*The Daily Oklahoman*, August 11, 1998).

Gotebo fire chief Kenny Sheffield echoed McDowell's sentiment of being under-equipped. Sheffield's volunteer crew has five trucks.

"You never have enough," he said. "At different times you get out to a fire and wish you had different things (*The Daily Oklahoman*, September 1, 1998)."

The state's drought plan provides suggestions for borrowing equipment from other jurisdictions but equipment sharing hinges on that equipment remaining available. If another jurisdiction is using the equipment, Oklahoma has no alternative provided. This does little to improve Oklahoma's standing readiness. The state government needs to allocate an annual special fund for the most wildfire challenged

jurisdictions to purchase needed equipment. This would especially help smaller, volunteer fire departments that do not have a large budget due to the lack of municipal fees generated.

Air Conditioning

The heat wave component of the drought claimed the lives of eight Oklahomans in July of 1996. Two years later, 19 Oklahomans died in the heat wave before the government took action.

Many of the heat deaths occurred because elderly citizens did not have the funds to pay the high electric bills that would stem from constant air conditioner use. Some did not even own air conditioners and could not afford to buy them.

Dr. James Farris of the Dallas County (TX) Health Department explained why many perish in Southwestern heat waves.

"Many elderly are reluctant to use air-conditioning because it drives up their utility bills and they're unable to make the payments (*The New York Times*, July 14, 1996)."

Non-profit organizations such as the Red Cross and Salvation Army purchased then distributed fans to the elderly and families to try to mitigate this (*USA Today*, July 17, 1998; *The Daily Oklahoman*, July 22, 1998) but as Farris pointed out, many households would not use fans or air conditioners that were in the home due to high electricity costs. That was the case in July 1998 when the heat wave claimed Lillie E. Hughes, 55, of Guthrie. Her relatives explained to police that Hughes was on a fixed income and afraid to use her fans because her electric bill would be too high to pay (*The Daily Oklahoman*, July 21, 1998). Some utilities have programs to help those on fixed incomes pay electric bills in the summer but residents may not know the programs exist or how to apply for them. Also, bills remain due while applying for assistance. The utility company may cut off one's electricity while a customer waits for assistance. OG&E Electrical Services only imposes a moratorium on cutoffs when the

forecasted heat index is 103 degrees or above (*The Daily Oklahoman*, July 22, 1998).

OG&E Electrical Services spokesperson Paul Renfrow offered one solution to the elderly and families who can not afford to pay high bills.

"The answer may be that they need to leave home and go somewhere else," he said. He suggested people go to a public place such as the mall, each day instead of remaining at home (*The Daily Oklahoman*, July 22, 1998).

But the most at-risk groups can not take this action; they are the seriously ill and home bound elderly. Tulsa Senior Services volunteer coordinator Connie Schupbach, explained to whom her organization donates and install air-conditioners.

"We are placing air conditioners primarily in homes of elderly, home bound people who are at risk," she said. "Some of these folks are bedridden, some are chair-ridden, and all have some sort of health problem."

The non-profits can not help everyone though. Their services depend on donations and grants. The Tulsa Weather Coalition had placed 100 units by mid-July 1998. Between the end of May and mid-July the Salvation Army had given away 402 fans.

The federal government experiences an instance of single-loop learning in mid-August, 1998. President Clinton issues additional emergency funding for those who can not afford air conditioning.

"This scorching heat wave has destroyed crops, caused widespread power outages, and worst of all, led to the deaths of more than 100 Americans," the President said. "The heat poses the greatest threat to our most vulnerable citizens - children, the disabled, and the elderly (*The Norman Transcript*, August 15, 1998)."

The onetime action provided a temporary aid measure. Each household in Oklahoma could gain up to $150 in utility bill assistance or toward the purchase of an air conditioner unit. The government did nothing, however, to insure that this would become a standard response in cases of drought.

The aid did not address the needs of the state's homeless shelters which filled so quickly they were forced to turn families away.

"Normally we have 16 to 20 families in the shelter this time of year," said Toni Hinton, director of social services for The Salvation Army. "There's been a remarkable increase because of the heat."

Not only did the shelters run at full capacity but their bills remained consistently higher than usual. But the government's aid package did not address these needs.

"The heat is having a devastating effect on people," said Grace Rescue Mission's director Gerald Lunsford. Grace has no air conditioning. It uses two large exhaust fans and several small box fans.

"The utility bills are incredibly high," Hinton said. "The extra money we use to pay them will come directly out of our operating funds."

The federal government needs to expand its funding in the future to include emergency and homeless shelters in its aid packages. A standing grant program that would automatically activate when drought hit any state would provide a safety net for these already overextended shelters.

Drought Length/Definition

Another point of contention is that many government agencies and academic researchers of drought look at 1996 and 1998 as separate events, as does the government. Agricultural producers look at the two closely connected years as part of the same drought.

During the 1998 drought Stratford, Oklahoma rancher Everett Cottrell said, "I think this drought that started back in 1996 will be remembered as the worst in history." Cottrell's herd shrunk from more than one thousand to 200 head since the drought began in 1996 (*The Christian Science Monitor*, August 24, 1998).

By separating the droughts, the government at all levels separated mitigation

and closed programs early. Farmers and ranchers needed these programs again only months after the government closed them. Before the government could distribute aid however, they had to be reactivated and restaffed. By keeping state and federal programs continuously open on at least a limited basis, with at least one part-time staffer to coordinate from droughtlet to droughtlet, the government could save valuable mitigation time and provide improved services to farmers.

State and Federal Government Response

The government's response in both droughts disappointed many agricultural producers. The government refused to listen to the needs of producers and provided the same solutions it had pre-drought plan.

"I believe the government is trying to push things on us that we don't need and don't want," said rancher Larry Campbell (*The Sunday Oklahoman*, May 26, 1996).

The 1998 response brought a similar reaction.

"The farmer needs help and he needs it right now," said Mike Cassidy of Cassidy Grain Co. "Washington does not seem to understand how severe the rural economic situation is (*The Sunday Oklahoman*, August 30, 1998)."

Wheat had just hit $2.14 per bushel. The state's average cash price for single month hadn't fallen below $2.20 per bushel since 1986.

"In areas of the state, this is the worst drought we've had since 1934," said Albert Ashwood, director of the Department of Civil Emergency Management and chairman of Oklahoma's Drought Management Team (*The Dallas Morning News*, July 29, 1998).

Though Oklahoma had been in an active drought since 1995, FEMA called for multi-state task force only after damage was done. It met in June 1996 (*Tulsa World*, May 25, 1996).

Many agricultural produces weren't prepared for the government's glib look at the situation.

"People have come through with relief after hurricanes and earthquakes," Glickman said. "I think they will come through for a farming disaster (*The Norman Transcript,* August 12, 1998)."

The government's we'll-get-to-it-when-we-get-to-it attitude hurt farmers and ranchers. Perhaps worse was the fact that throughout every drought that befell Oklahoma and the United States, citizens continued to voice their needs and the government continued to ignore them.

"They aren't paying enough attention to this," says cattleman Fred Sanders, of the federal government (*The Christian Science Monitor*, August 24, 1998).

Gary Goldberg, president of the American Corn Growers Association gave an apt example of the government's communications ineptitude. He said Congress' 1998 proposed tax relief to help farmers weather the $7.5 billion drop in farm income can't help farmers with virtually no income .

"Farmers are devastated by what's happening out there and nothing is being done," he said (*Tulsa World*, August 13, 1998).

Executive director of the Oklahoma Wheat Commission, Mark Hodges, agreed that agricultural producers needed immediate government action.

"I have not seen this serious of a situation where, for five years in a row, we've had extreme weather conditions in at least some part of the state," said Mark Hodges, executive director of the Oklahoma Wheat Commission. "We need changes quickly (*The Sunday Oklahoman*, August 30, 1998)."

In 1998 Congressional Republicans favored: accelerated U.S. Department of Agriculture transition payments, crop loan caps and exemptions on trade sanctions to international markets (*Tulsa World*, July 16, 1998).

Following a July 1998 meeting with agricultural producers and his three fellow Oklahoma Congressmen, Rep. Frank Lucas, R-Cheyenne, stated the obvious, "We came out of that meeting agreeing we have a real problem. We need to come up with

a real solution."

Problems with the current programs do exist. Transition payments, available to farmers that participated in the pre-1996 programs, make fixed payments to a farmer whether or not he grew a crop. Republican congressmen proposed paying the farmers in October, "rather than waiting three months to get half and a year to get the other half (*The Daily Oklahoman*, July18, 1998)." Congress should implement a permanent solution that would deliver these payments on an immediate payment when disaster strikes rather than having to band-aid the situation each time it comes up.

But agricultural producers weren't simply complaining about what the government wasn't providing. They offered solutions. In 1996, the National Cattleman's Association recommended that the federal government take the following steps in addition to those already taken:

- ☑ the Secretary of defense increase military beef purchases
- ☑ the USDA expedite loan guarantees to increase export of breeding cattle to Mexico
- ☑ the USDA use loan guarantees to speed up expansion of beef exports to developing countries
- ☑ work with the financial industry to calm fears about the market and business climate of cattle industry (*The Oklahoman & Times*, May 4, 1996).

Rancher Stanley Barby wants a focus on long-term solutions. He suggested farmers and ranchers focus on devising markets for the products currently produced. He said this would require the government to provide long-term loan interest financial assistance (*The Daily Oklahoman*, July 27, 1998).

General Economy

During drought in a heavily agriculturized area such as Oklahoma, the overall economy suffers because loss of farm income impacts spending capabilities in agriculture service businesses. This income depression can cause a drop in consumer confidence, as it did in 1996. Creighton University economics professor Ernie Goss

explained Oklahoma's economy as represented in the 1996 Mid-American Business Conditions Index, which he calculates.

"Natural disasters such as a drought have a significant psychological impact as consumers and producers lose confidence in the economy, even though they are not directly impacted by the drought. Oklahoma's region-low confidence index of 50 illustrates this," Goss said (*Associated Press*, July 2, 1996).

The index ranges from 0 to 100, with a score above 50 representing economic growth and a score below 50 representing a sluggish economy. Oklahoma's June score of 50.5 fell from 51.3 the month before. June marked the second month in a row for a drop in the Oklahoma score. Meanwhile, the overall index which relies on the economies of nine mid-western states, rose to 57.5 from 56.1 the month before. The national index rose that month from 49.3 to 54.3.

State Agriculture Secretary Dennis Howard said improvements in the areas of markets and exports would provide a long-term solution to the effects drought has on the agriculture economy (*The Daily Oklahoman*, July 29, 1998). Those improvements are indeed part of the overall solution that must include improved drought mitigation and producer education.

Henry Jo Van Tungein of the Oklahoma Wheat Commission agreed with Howard.

"The low commodity prices and our lack of markets has a lot to do with it," he said (*The Daily Oklahoman*, July 29, 1998).

Agri-Business

Though the drought affected the general economy, it hit the farm supply industry particularly hard because agricultural producers had less to spend on materials (*Elk City News*, May 9, 1996). For instance, many businesses in Lamont closed their doors in 1996 due to drought (*Associated Press*, May 10, 1996).

The situation repeated itself in 1998. Farmer Bobby Tarp pointed out how far-reaching the effects of a drought are.

"All the people we do business with are going to be hurt by this too. We have no money to spend (*The Norman Oklahoman*, July 31, 1998)."

Carl Anderson, Texas A&M agricultural economist explained how the drought effects the overall farm-based economy.

"In metropolitan cities, the impact will be felt in consumer prices and in those businesses connected to agriculture," said "But the real impact will be felt in smaller farm communities, and it's going to be devastating. They're going to have problems collecting taxes to keep open their schools. It's going to speed up the drying up of these small, rural communities (*The New York Times*, August 12, 1998)."

The situation in the late 1990s did not compare with the 1980s, the last decade the agricultural community faced a major drought.

"The farm economy was booming back then and farmers were able to build a nest egg. This past couple of years the crops and cattle haven't been so good, so the reserves aren't there (*The New York Times*, August 12, 1998)."

The government was taken by surprise in the 1990s since the situation differed economically from its most recent experiences. The emergency responses applied to the drought situation did not provide alternatives applicable to varied situations.

"Usually, you don't have a time when you've got a disaster and you have low prices," said Dan Glickman, U.S. Agriculture Secretary. "Usually, when you have a disaster you have high prices (*The Daily Oklahoman*, July 29, 1998)."

Ironically, an old assistance program, advance deficiency payments, caused many farmers additional money worries. Since 1995's wheat prices exceeded the $4 target price the government had set, farmers didn't receive the expected deficiency payments. Those who had accepted a 25 cent per bushel advance on the anticipated payments then had to pay the government back those funds.

Dennis Howard suggested the state legislature extend the exemption from taxa-

tion on family farms from $175,000 to the $675,000, the same exemption allowed by the federal government. He said all the states surrounding Oklahoma match the federal exemption (*Vinita Journal*, May 10, 1996).

Rancher Stanley Barby says the government has "regulated us into a corner." (*The Sunday Oklahoman*, May 26, 1996)

The government, at the federal and state levels, needs to create flexible economic support programs that provide for more than low-interest loans (which seems to be the government's answer to everything) to deal with drought's innumerous effects at multiple levels. Grant programs with eligibility tied to risk management planning alternatives enumerated in the organization's business plan, loan interest payments or forgiveness during a drought crisis, tax breaks- exemptions or credits, and loan payment postponements or a skip a payment option provide some economic mitigation alternatives the government at either or both levels could implement through existing agencies such as the Small Business Administration and the Internal Revenue Service.

Loans

As early as June 1996 farmers told one of their Congressional representatives, Sen. Don Nickles, in a public meeting that low interest loans were not the answer.

"We don't need more debt (*Associated Press*, June 1, 1996)."

In 1998, farmers echoed the statement. Again, their words fell on deaf ears.

"They talk about low-interest loans, which aren't going to do anybody any good because a lot of them have borrowed all they can borrow anyway," said Ed Granger, a Gracemont farmer and cattleman. Granger suggested the government pay the interest on producers' loans (*The Daily Oklahoman*, July 29, 1998).

Farmers already burdened with loan repayments found that the loans that previously helped them now hindered them. Ceilings on assistance in the debt re-

structuring program the Farm Service Agency created in the mid 1980s rendered some farmers ineligible for further assistance.

"If that person has already had part of his debt written off for some reason, we're limited on what we can do," said Phil Estes, agriculture credit specialist in the FSA Stillwater office. "If they have already had one forgiveness - we wrote off the debt for some reason - they are ineligible (*The Sunday Oklahoman*, June 2, 1996)."

Executive vice-president of First State Bank in Boise City, Tim Barnes, explains why banks often can't help.

"Lack of crop means lack of income. It's a pretty serious situations. There comes a point in time where you can no longer finance a farmer or rancher because he has too much debt (*The Journal Record*, June 27, 1996)."

Mark Hodges, executive director of the Oklahoma Wheat Commission further elucidated on the loan problems producers face.

"Most producers have lost so much equity over the last five years, they aren't going to be able to borrow their way out of this situation," he said (*The Daily Oklahoman*, July 27, 1998; July 29, 1998). "Although the drought assistance is needed, low-interest loans are not going to be the answer for many of our producers."

Gary Nippert, a vice-president and branch manager at Mangum's Great Plains National Bank, said the strong spring crops were helping farmers hold their own but the drought began a negative long-range effect because it wiped out any potential gains. Nippert knows the effects so well because he runs cattle himself.

"Financially, we're seeing the start to something that could have a long-range effect," he said. "Take a cow-calf. A few months ago you could get $750 or $800 for one. Now you might get $550. But, you don't lose that money unless you sell. Some people might decide to ride it out. You just have to decide at what point does it no longer become feasible. It's like flipping a coin."

"What would help more than cheap money would be something along the lines

of the feed program of the past," said rancher Robert Fulbright. The program that shared costs of emergency feed purposes was discontinued in the 1996 farm bill.

Some farmers who hadn't already hit their ceilings admitted the loans might help on a limited basis- if the funds came quickly, when needed for monthly and seasonal payments and without burdensome paperwork. Some suggested instead of loans, the government should return to offering direct disaster payments and emergency feed programs.

"A low-interest loan will help but that depends on how much red tape you have to go through and how quickly you can get it," said Ed Coufal, a Bell County, Texas corn producer who lost 70 percent of his crop to drought.

Coufal explained that it took some producers in his area two years to receive assistance from the 1996 drought. Producers needed the payments before November when production loans are generally due at commercial banks. To begin the process, farmers must fill out a 22-page form at local offices of the Farm Service Agency. To qualify farmers and ranchers must be unable to obtain other credit, have suffered a 30 percent loss or greater, provide adequate loan security and show how they will be able to repay the loan. Loans cover up to 80 percent of losses and ceiling at $500,000 (*The Dallas Morning News*, July 24, 1998).

The federal government should implement some of the many suggestions that producers gave for alternatives to loans. These mitigation alternatives include: making the interest payments on producer's loans, recreating the program that shared costs of emergency feed, and offering direct disaster payments for producers not covered by crop insurance. Restructuring the loan forgiveness program would provide another alternative that could help save farms and ranches.

Crop Insurance

The government must also revisit the crop insurance program, while producers must revisit the way they utilize it. One government requirement that needs to go

is that to collect crop insurance farmers had to plow under what little good growth they'd had (*Time, Special Report*, 1996). What a producer can eke out in a disaster situation should be reaped and used or sold in order to supplement the lost portion that insurance covers.

On the other side of the coin, farmers need to increase the amount of insurance purchased. David Schertz of College Station, Texas, bought basic crop insurance for his 2,500 acre farm but the policy will not cover his drought losses.

"It's a minimal insurance," he said. "You can buy up more insurance, but you're talking about a lot of expense there."

This insurance is a basic business expense though and farmers should automatically factor full coverage into their annual and seasonal budgets. If producers continue to under purchase this insurance during the next, say two- to three-year period, the government should make a full coverage a requirement for fulfillment of other incentives such as eligibility for other disaster assistance. Agricultural production is still a business, though a chancy one. Farmers and ranchers must plan for the bad times as well as the good.

Farmer/rancher Jason Wendler's situation aptly illustrates why full coverage crop insurance needs to be a requirement.

"We've had a major flood in '91, a drought in '90, a drought in '96, and a drought in '98. And you can bet that I'll hedge myself against possibly another one being around the corner again (*American Farm Bureau Focus on Agriculture*, September 6, 1998)."

But the drought also caused problems for producers trying to acquire crop insurance.

In 1998 the Associated Press reported that the Southern drought and chronic wet weather in the Upper Plains has left thousands of farmers unable to get adequate coverage (*The Associated Press*, July 29, 1998). Among the problems farm-

ers faced were the penalties for farmers suffering repeated natural disasters, disallowal of coverage for farmers trying a new crop, and increasing coverage for livestock.

"Crop insurance was not designed for ... high risk agriculture," said Dr. Ronald Knutson, director of the Agriculture Food and Policy Center at Texas A&M University (*The Dallas Morning News*, July 30, 1998).

Kansas Farmer Union Vice President Tom Giessel concurred, explaining why the current insurance program needs revamping.

"The program doesn't work for many producers under today's stressed market conditions," said Kansas Farmer Union Vice President Tom Giessel. "Farmers need adequate risk protection to help cushion the blow of falling prices and repeated weather and crop disasters... Congress must pass the emergency indemnity program to make up for the shortfall plaguing producers now."

Giessel outlined some of the reforms needed: first, Congress must boost the level of crop insurance coverage, and, second, address low prices by lifting caps on marketing loan rates (*National Farmers Union News*, August 26, 1998).

Another issue that requires address: Livestock producers are not eligible for crop insurance. The federal government offered few mitigation alternatives for livestock producers. These included the possibility of emergency feed assistance in a Senate bill and an extension on time for ranchers to graze cattle on Conservation Reserve Program lands. This only helps those with CRP lands though (*The Dallas Morning News*, July 30, 1998). The government must include livestock producers in its insurance program, following the same suggested criteria as for farmers, i.e. requiring a workable, implementable risk management plan that focuses, not on government bailouts but self-mitigation.

Safety Net Needs

Many farmers and ranchers expressed the need for a government safety net

for the agricultural community similar to support provided by many European countries and the Australian governments. Farmer Emmett Matthews said his hopes that Glickman's visit to Oklahoma would get Congress to include in the farm program "a safety net that will cover our disasters like this year (1998) (*The Daily Oklahoman*, July 29, 1998)."

Bobby Tarp concurred, saying farmers need legislation to protect against disasters. He also said the government should open low interest loan application to all farmers and should provide instructions for how to apply for available loans (*The Norman Oklahoman*, July 31, 1998).

Quick Mitigation

During both droughts agricultural producers needed results from mitigation from the drought's beginning. This meant hay to feed cattle, funds for seasonal payments, special water concessions, irrigation assistance, release of CRP lands and others. The main complaint of slow mitigation concerned the government's favorite standby, low interest loans. Farmers who met Glickman on his viewing trip told him they and others would go under if immediate assistance wasn't made available.

"If things don't change, a big percentage of these farmers won't be here next year," said Jim Roberts, a McClain County farmer.

Glickman responded that farmers in the 66-county disaster area are eligible for low-interest 3.75 percent federal loans. He said that once approved for the loans, the money would quickly be distributed. Many farmers were concerned that the loans in 1998 would take as long to distribute as the ones in 1996. As previously discussed, some farmers did not receive their 1996 loan monies until 1998, well past the time the time of need.

Glickman conceded though that the help available was not nearly enough (*Tulsa World*, July 29, 1998). His only suggestion was that Congress take action soon to provide further assistance of a nonspecific nature.

Freedom to Farm

The agricultural economy suffered many blows from 1996's Freedom to Farm law. One of the programs ended by the 1996 law allowed participating wheat farmers in 1996 to receive 87 cents per bushel based on a previously established production based (*The Sunday Oklahoman*, June 2, 1996).

Gary Goldberg, president of the American Corn Growers Association says Freedom to Farm encouraged farmers to plant more crops to make up for subsidy loss (*Tulsa World*, August 13, 1998).

Terry Francl, senior economist for the American Farm Bureau Federation wants to just wait and see Freedom to Farm's final effect.

"To test the new farm program, we have to go through a down cycle and have farmers react to it."

Risk/Business Management

In fairness, the government wasn't the only one not ready for a drought. It caught farmers and ranchers by surprise, too. The majority of agriculture producers were not ready for the possibility of drought though it's a recurring disaster in their chosen field. Though there had been a low-rain pattern over multiple years, farmers didn't factor this into business plans. They made no plans for irrigation or alternative crops. They stopped using conservation measures the government once mandated.

Academics such as Dr. Jerry R. Skees, an agricultural economist at the University of Kentucky, say farmers need to learn and implement risk management . Agreed, but someone needs to teach them risk management techniques. Most academics offering such statements don't offer solutions for how to provide the necessary training.

"Just as farmers drove faster and harder when roll bars were placed on tractors, they will take on more debt and take more risk if the government attempts

to artificially reduce the risk in agriculture," Skees said (*The Daily Oklahoman*, July 31, 1998).

Agreed again. The government needs to force self-reliance on agricultural producers. Multiple options for this exist. First, require producers to purchase crop insurance in viable amounts. A viable amount means the producers insure themselves to a level that their insurance payment will cover their bills without outside assistance. This also means providing an insurance program for ranchers, a group that was not covered under the 1998 drought.

The McAlester News-Cap & Democrat points out that "farming, unlike other industries, relies heavily on outside, uncontrollable forces - namely weather (May 10, 1996)." While this is true though one can plan for these uncontrollable forces but history shows that many agricultural producers do ignore risk management for the gamble that regular planting of the same crop(s). Farmer Tom Hill describes how bad it was during the 1996 drought: "Right now you'd be almost be better off taking your money to Vegas. The odds would be better. From here (Lamont), right up north, there hasn't been a decent wheat crop in four years (*Associated Press*, May 10, 1996)."

Second, provide free training in risk management to all agricultural producers. Without immediately and locally available opportunities for training, these family businesses have no recourse but to use the same gambling techniques as they have for years. Jerry Krasser, manager of Lawton Co-Op explained the farmer's theory of survival.

"The farmer's theory is if you have cotton, if you have wheat, if you have cattle, you can survive. But none of them came out this year, and farms aren't surviving."

Farmers attribute part of the gamble to low yield estimates.

"When you get down to about the ten bushel mark, it's a question about whether it will pay to harvest," said farmer Brad Brainard (*Associated Press*, June 16, 1996).

Beaver, Oklahoma farmer Denzil Wilmoth realizes that times have changed. "There's no such thing as getting by on the milk check and what the hens can lay you, " said 81-year-old Wilmoth of . "That's ancient history (*The New York Times*, May 20, 1996)."

Pawhuska, Oklahoma rancher Frederick Drummond knows all the variables. His family began ranching in 1887 when they settled in the Osage region. And it's not just the weather though, as he points out.

"From beginning to end, it's the weather, the grain supply. It's the government. It's the variations of those fundamentals that make this so hazardous," he said.

Mike Mahoney, executive vice-president of Wheeler Brothers Grain Co. explained the variety of questions a farmer faces.

"People haven't got the ground worked. And with the drought people are sitting here thinking, 'what kind of year are we going to have? If we get rain and I get my ground worked, should I fertilize? Is it going to turn off dry again?" he said (*The Daily Oklahoman*, September 8, 1998).

Farmers and ranchers know times have changed. What they don't necessarily know is how to change with them. The government needs to require risk management training and a well researched, workable business plan that includes significant address of natural hazards such as drought, as part of the qualifications for either crop insurance or drought mitigation provisions (i.e. hay transport program, loan programs) or both. Since, at present, the insurance program does not cover ranchers, requiring this plan for both would be the optimum choice.

Third, as a result of the previous provision of training, require a viable risk management plan that offers self-mitigation alternatives, rather than reliance on government mitigation. This leaves the governments' actions as support mitigation rather than first level mitigation.

The government should provide, through the U.S. Department of Agriculture,

free training for these agricultural producers so they may learn to research and author these plans. The answers to distribution of this training may not be as simple as the government would like. Many agencies have jumped on the Internet bandwagon and list much of the most needed information there. Though this may provide the most easily accessible solution for the government, it would not provide the best solution for the end-user- the farmer and rancher. Most 81-year-old wheat farmers living in rural Oklahoma do not have modern computers with high speed Internet access nor the training to use these machines. Some rural areas in Oklahoma still share water wells rather than have piped running water, as mentioned in the previous chapter. The rural Internet infrastructure of America is not yet developed enough for a Web based alternative to provide adequately as a training mechanism.

The government will need to author printed materials, written in a simple, understandable, non-technical format that gives detailed explanations of what a proper plan would cover and state. Distribution of these should occur through a direct mailing of the agricultural producers currently known to the government through records such as the CRP program, loan information, etc. A second distribution point presents itself through the state office of the Department of Agriculture. The government should ensure these risk management plans meet the minimum standards of actual, workable self-mitigation through random audit.

Fourth, the federal government should automatically loosen provisions on CRP lands as soon as a drought hits, rather than waiting until other feed possibilities are extremely strained or exhausted.

Feed Costs

Feed cost was a recurring issue that needed continued address. High wheat and hay prices were good for farmers but bad for cattlemen because they were already losing money and couldn't afford to pay rising feed costs.

"This may be the worst economic squeeze dairymen have faced in 50 years,"

said Calvin Buchanam, Decatur, Texas, dairy farmer. "Feed accounts for more than half of our operating costs, so even a modest increase in the price of feed can play havoc with our operating budget (*Enid News & Eagle*, May 10, 1996)."

Direct cost of hay only composed half the problem. Transportation costs prohibited most ranchers from purchasing hay in needed quantities. Durant rancher Martin Van Meter said he paid $42 a roll for hay on August 1 (*Tulsa World, August 2, 1998*).

Increased sell-off was another important feed cost related issue. Sell-off on Oklahoma cattle occurred at three times normal rate. This means that ranchers had to sell more cattle in a quicker turnaround on the investment. It also meant that a glutted market and under-weight cattle dropped the price cattle brought per head. Ranchers sold steers for half the regular price. Sales barn owners predicted the price would fall another 10-15 percent before the drought's end (*The Christian Science Monitor*, August 24, 1998). The sell-off occurred because feed costs climbed too high to allow a significant profit.

The government used a feed cost sharing program in 1996 which Congress later disbanded through the 1996 Freedom to Farm law. This forced the government to create new methods of hay/feed assistance which could not aid as many ranchers. The new program, which became known as the Cow Chow Express, provided some free hay and provided for free delivery of hay that had been purchased or donated.

"Due to the drought we have a severe shortage of hay," said state Rep. Mike Mass, Hartshorne, OK. "Our folks here have been able to locate hay farther north, but they're having difficulty with hauling." Hartshorne suggested having the Oklahoma National Guard haul the hay.

The high costs of a program such as this limited the impact area serviced. The program also limited the amounts of hay available per rancher and the length of the program.

"(It's) a band-aid right now. I don't know if we are making a dent in it or not," said Bryan County Extension Agriculture Agent Clay Jones (*Tulsa World*, August 2, 1998).

Bryan County has approximately 1,400 beef cattle producers, Jones said.

"If we just count what they are limited to, I need about 12,000 rolls for the people that are on the list right now. If we count what they really need, it's probably about 40,000 or 50,000 rolls," Jones said (*Tulsa World*, August 2, 1998).

He said 380 farmers had requested hay assistance. Dozens more asked for assistance on Saturday. Saturday's shipment delivered 210 large round bales of hay. The National Guard delivered another 190 hay bales the following day. About two dozen people received hay from the weekend's shipment. The government set the purchase limit at 30 bales per person (Tulsa World, August 2, 1998).

"There's more dirt showing than anything else," said Bokchito rancher Romee Bianchi. "I think they're (his cattle) even going to eat the ragweed (*Tulsa World*, August 2, 1998)."

The National Guard ended its involvement in the program on September 13, 1998 after delivering 26,696 bales. By ending the program so early, it failed to provide adequately for future needs. The government considered only the immediate effects of the drought- that ranchers' hay did not grow at that time- but ranchers had to feed their herds throughout the year.

"If we don't get moisture in the next couple of months... we won't have anything to feed out cattle this winter," said Mike Brooks, former Oklahoma Cattlemen's Association president (*The Daily Oklahoman*, August 13, 1998).

Ranchers explained why the feed assistance became so vital. Larry Krebs cut 1,200 to 1,500 bales from his 1998 wheat cut. He used it to feed his 80 dairy and 30 beef cattle. Last year he sold 300 large square bales to make ends meet.

"It's heart wrenching because the price (of hay) is good. Selling hay let us make the land payment last year. I already told the bank... we won't make it this

year," he said (*The Daily Oklahoman*, August 1, 1998).

A return to a program similar to 1996's offering would expand the number of agricultural producers aided. If the government continues to use the 1998 program, it should be as a support program to a more expansive mitigation effort. The number of bales per person should increase, as should the speed of implementation of the program and the shipment size.

Other Cattle Issues

Private businesses came up with various mitigation techniques but not all used them. Dairies, such as the Braum's Dairy in Tuttle, equipped sheds with fans and misting devices to keep cows cool and maintain milk production. Cattle feed yards, such as the Buffalo feed yard, however, did not use these methods and lost three head of cattle to the heat (*Enid Eagle & News*, June 21, 1996). Not all private businesses can afford installation of expensive mitigation devices. By providing a grant program specifically for equipping a business with natural hazard or emergency management devices and including drought in this program, the Small Business Administration could assist small private businesses in protecting their investment.

Cutting Expenses

While agri-businesses sometimes spent more, agricultural producers cut expenses any way they could. Ronnie Wyatt explained that farmers cut expenditures to the bone by forgoing needed equipment repairs to avoid taking out more loans. Broken equipment means less ability to harvest which means less product for sale (*The Daily Oklahoman*, September 8, 1998).

Replanting Alternatives

Replanting provided another avenue for saving money in some cases. Many farmers in the western part of the state such as Beaver, plowed under their undergrown winter wheat crop. What should have been waist high was ankle high. They replanted with an alternate fall crop such as feed grain. Milo, used a feed for live-

stock, became a favorite of those who attempted an alternative crop. Oklahoma provides a ready market for milo with its hog farms and other livestock operations.

"Everybody ought to be trying to diversify and raise some of it instead of having it shipped in out of Kansas and other Plains states," said farmer Ralph Meade who had a successful milo crop. Meade reaped a milo crop average of 14 bushels per acre on 750 acres (*The Daily Oklahoman*, June 16, 1996).

Meade's crop diversity is not the norm. Perhaps a by-product of the old farm program rules that penalized wheat growers for planting other crops or poor planning, many farmer have no contingency plan and rely on the government for assistance.

"I know I can go one more year, but I'm going to lose some neighbors over this deal if the government doesn't come through with some kind of disaster deal," Meade said. "And I don't want to lost any neighbors."

Other farmers planted milo only as protective cover for topsoils that continually blew away. They planted wheat seed in the milo stubble to protect the fields and hold in moisture. Cotton became a trial alternative crop in northern Oklahoma because it could do well on "not real good land (*The Sunday Oklahoman*, September 20, 1998)."

Most producers haven't had luck growing alternative crops hasn't worked so far because all prices are so low it's nearly impossible to recoup production costs (*The Norman Transcript*, September 13, 1998). Planting alternative crops can only become a viable alternative with planting incentives such as price supports.

Irrigation

Even with alternative crops, any crop needs water to thrive. Yet with drought in the state as prevalent as it is, eighty percent of cotton farmers in OK don't irrigate. They waited for rain or planted an alternative crop (*The Associated Press*, May 9, 1996).

Irrigation works but costs remain high. Archie Gottschall of Frederick has part of his fields irrigated but can't afford to irrigate them all. One electric bill for the irrigation operation cost $800 (*The Sunday Oklahoman*, July 26, 1998).

Farmer Joel Garrison's (Harris, OK) alfalfa yields are half the tonnage per cutting as normal, even with round-the-clock irrigation. His electric bill for one irrigation motor came to $2,047. He runs 10 motors.

Lynn Bartlett agrees that the added expense deletes profits.

"The irrigated cotton is close to normal but it's costing me $50 more an acre in watering," he said. "That's an expensive crop I've got in the ground."

Bartlett expects to lose about half of what he would have earned on the normal crop (*The New York Times*, August 12, 1998).

But though costly, the fact remains that it works. Farmer Tom Stephens uses it and his fields showed promising yields even during drought (*The Sunday Oklahoman*, May 27, 1996).

Balancing the costs of irrigation with improved production is tough enough in prime growing conditions but almost impossible during drought. Increasing crop yields makes the implementation of irrigation instrumental. The government mandated conservation measures at the end of the New Deal, including year-round, drought resistant grasses to hold soil into place and tree barriers that reduce the force of the wind. The government could re-implement these requirements, along with one for at least a limited irrigation backup (*The New York Times*, May 20, 1996). State and federal government should help farmers by offering one time grants, not loans, to purchase and install necessary equipment, such as the center pivot irrigation system Stephens uses. A discounted rate on irrigation water during drought would help alleviate the costs, as would a cost sharing program such as the one used to provide low-income families with monies to purchase air conditioners or pay electric bills. This program would instead aid in the payment of operating costs and irrigation water during

drought.

Second Jobs

To make ends meet many farmers took second jobs. Some farmers spouses returned to work to help support families (*Enid News & Eagle*, May 10, 1996).

Farmer Carl J. Rose took a second job to help pay bills. In July Rose faced his first major financial hurdle, $30,000 in bills. The small plot of his wheat that had survived the drought succumbed to a May hailstorm. He was unable to sell his cattle because they would not bring enough money to cover what he owes on them (*Associated Press*, June 16, 1996).

Selling to Survive

For those farmers and ranchers who could not take a second job, selling their cattle or land became a major survival technique. Ranchers such as Guy Payne were forced to sell their breeding stock because they couldn't afford to feed them.

"I'm selling part of my factory, you could say," Payne said. "It's going to put me in a very vulnerable situation (*Tulsa World*, May 9, 1996)."

Truman Zybach sold four truckloads of cattle, leaving him with only 50 to 60 head to raise on his 1,700 acre ranch. He would normally have 700 head this time of year (*The New York Times*, August 12, 1998).

Farmer/rancher Marvin Glazier found himself heading for the same situation.

"We've got a bunch of cattle to sell next week that we bought last spring and we'll be lucky to break even," Glazier said. "We soon won't have many young farmers left in this country (*Farm Bureau News*, September 7, 1998)."

Rancher James Moore predicted the situation would only worsen.

"I see a mass movement coming to sell at the livestock auction," said rancher James Moore. "I'm really concerned for the small farming community of Hollis. The Red (River) is completely dry. It looks like a really nice beach with no water."

For farmer Frank Skaggs selling some of his land brought in the extra income

his family needed. He sold 80 acres of land to pay bills.

"We have quite a bit of land but we also have quite a bit of debt," his wife, Billie Skaggs said. The couple want to reduce the amount of debt they have as they grow older (*Associated Press*, May 10, 1996).

Obviously, forcing farmers and ranchers into a predicament where their only immediate mitigation technique is a forced sell to survive situation is not the proper one to facilitate the survival of the small farmer. The government can assist family farms and ranches by addressing the needs for immediately available monies for operating expenses, improving the crop insurance program as previously described, and implementing a cost sharing program for feed purchases as also previously described.

Farmers and ranchers can improve the odds of survival in their favor by implementing contingency planning in their annual planning activities. This starts with a well researched and thought out planting and/or buying plan that does not automatically assume the feasibility of implementing the previous year's plan again. Part of this contingency planning should include a firm decision matrix to refer to with alternate means of dealing with setbacks and losses. Dependency on the government for bailout should not be included in these options. Independent survival should pervade the plans.

Losing a Family Tradition

Some didn't fare so well in the drought. A piecemeal sell off could not always guarantee survival. Ranchers Norma and Larry Scott had to quit the business. Two of their three ponds dried up. The cost of feeding the cattle during the drought would have required them to borrow $9,000. They sold off their cattle at Red River Livestock Market in late July of 1998 (*Associated Press*, July 23, 1998).

In an effort to muffle the necessity of government mitigation some government officials tried to turn the focus from their inaction to God.

"Ultimately, it is only God who can provide the moisture to sustain this land," Governor Keating said (*The Norman Transcript*, July 28, 1998). However, that statement misleads state residents by refusing to admit the many mitigatory actions that the government could take to sustain the land and the livelihoods of agricultural producers, such as assisting producers in the purchase and installation of irrigation equipment.

Secretary Glickman on the other hand, sees the need for government intervention.

"No farmer should go under because on an act of God," he said. "We really have to have a program that protects people so that their bankers and everyone else will have the security to know that they can stay in business."

Farmers and ranchers desperately need the programs Glickman envisions, as one newspaper editorial pointed out.

"Federal assistance... seldom if ever allows a farm family even to approach making up for its losses *(The Norman Transcript,* July 30, 1998).

Mangum cotton farmer Jimmy Heatly, like many Oklahoma farmers, grew up watching his parents do just what he does now. He fondly remembers learning to drive a tractor when he was six years old. He had to sit on a bucket to see where he was going.

"My dad was a farmer and my grandfather was a farmer," he said, as he watched his crops die. "I suppose if they had inherited a million dollars, they probably would have farmed a little more (*The Sunday Oklahoman*, September 20, 1998)."

In 1996 and 1998, Congress argued whether the cause of agricultural producers problems stemmed from reduced overseas markets, trade sanctions, the Freedom to Farm law, or some other political situation. These issues certainly enhanced the troubles producers experienced but the fact is that at times, temperatures rise, rain doesn't fall, ground hardens, water tables deplete and this equals drought.

Drought and the direct mitigation thereof, is the issue, in and of itself, that the governments of the United States and Oklahoma must address. In the late 1990s in Oklahoma and much of the southwestern United States, drought claimed lives, decimated crops, dried lakes and streams and spurned wildfire conditions that burned more than 300, 000 acres of land. That our government continues to band-aid this recurring natural disaster with programs that continually fail to meet the needs of those affected is a disgrace. There are possible solutions but the responsibility rests on our government to implement and enforce them and our citizens to adhere to them.

Without implementing vast changes in the mitigation of drought at all levels of government, the government will continue the downward spiral of rural communities across Oklahoma and the rest of our country. The government's refusal to treat a significantly rural natural disaster, drought, as an emergency management situation continues to destroy the core of America.

"I'd hate to leave," said Carl J.Rose, whose grandfather homesteaded the land he farms. "I've got a little boy who's 6 years old. All he wants to do is farm. I'd sure like for him to farm. I'd like for him to eat. You can't do both (*Associated Press*, June 16, 1996)."

Chapter 6
Findings

Findings

In conclusion, after comparing the drought responses of the Oklahoma and the United States governments in 1995-96 and 1998 the need for certain specific actions at both state and national levels becomes evident. The first state level action should be an update of Oklahoma's drought plan and creation of an at least annual schedule for its update. Oklahoma's current drought plan has a number of trouble spots. It only suggests responses. It does not address responses for consistently recurring problems such as water shortages. It doesn't contain specific, detailed instruction for implementing responses. It suggests collaborations between agencies and entities that no longer exist. It provides no one agency with directorial powers, in other words, there is no leader. As far as one can determine from a comparison of historical data from both drought instances, the plan made little to no difference in actual mitigation.

At the national level, the government, working with the states, needs to develop a drought definition that recognizes that drought is a regional or local event and addresses drought intensity, duration, and frequency. This definition, for example, would recognize that what is a drought in Oklahoma would be normal in another state and vice versa. It needs to choose one combination of indices acceptable at the federal, state and local levels that provides early warning, as well as, the capability to track the drought's development and end.

The national government should set policy *and* procedure for assessment and response, considering both long and short term droughts. (Congressional creation of the National Drought Policy Commission in 1998 marks a small step in the right direction but does too little. The NDPC is an advisory commission that provides advice and recommendations which has little effect on actual mitigation.)

Part of this policy and procedure should be the requirement of each state to create a *viable* drought plan. The drought plan must be dynamic and must incorporate new technologies. Planning should integrate the national, state and local levels of government encouraging creative collaboration. As Wilhite (1987; 1993) has stated, the government should undertake and implement these planning actions during non-drought periods.

The government at multiple levels needs to realize that drought is a distinctly regional, normal climatic event caused by an extended precipitation shortfall sometimes accompanied by a heat wave and/or exacerbated by high winds and/or low relative humidity. Drought will continue to occur in the United States and the government needs to be prepared for it. It needs to prepare standard yet flexible mitigation actions in the areas of meteorological, hydrological, agricultural and socio-economic drought.

As Ventriss and Luke state, government policies should address local defined needs within the unique socio-economic and political context in which local clients or aid recipients live. This requires government to continually modify policies rather than use "blueprint solutions."

One way to go beyond blueprint solutions is to utilize collaborative management. This type of management involves stakeholders at all levels in problem detection, solution development and solution implementation. Using this technique would mean that when agricultural producers as stakeholders said that low interest loans would not help them and that offered other alternative solutions, it would be those alternative solutions that the government would implement, while continuing to offer loans as an option. Collaborative management recognizes the validity of the values and needs of all stakeholders and combines these with gov-

ernment to create innovative solutions endorsed by the collaborative group, not just the bureaucratic agency.

By recognizing that Wilhite's (1993) constraints to mitigation apply to government at all levels, the state government should implement a collaborative training program for local, county and state level personnel in all drought related fields, including but not limited to emergency management, fire suppression, water and land management, and agriculture.

This training should develop personnel and organization's abilities to implement the three basic steps that lead to the development learning climates:

1. encourage individual learning
2. continually review and modify operations assumptions
3. include clients in the process (Richards, 1994).

Further, the training should teach how to include the Richards' (1994) five organizational design factors that impact learning failure: clarity of purpose, leadership, experimentation, transfer of knowledge, teamwork.

Using these five design factors it becomes evident that the Oklahoma drought plan does not foster a learning environment. Richards recognizes that for an organization to succeed all its members must share a **clarity of purpose**, or clear understanding of its objectives and how their work contributes to them. Agencies covered in the Oklahoma drought plan sometimes did not know they were included. Personnel at these agencies were not aware they had mitigation duties. The **leadership** of the organization needs to use a coaching, motivational approach to create an egalitarian climate. Managers must foster an open environment that allows for constructive criticisms though they may challenge the status quo. Though many sources, such as fire suppression personnel, offered constructive criticisms, these weren't encoded or implemented.

Third, the organization must encourage **experimentation** by removing obstacles to innovation by setting broad policy guidelines for employees to work within. The agencies mitigating drought stuck with the same mitigation techniques they'd used for years though those affected by the drought, such as agricultural producers, stated plainly what was actually needed and that the traditional mitigation consisting mostly of loans, would not work.

Fourth, **transfer of knowledge**, allows a free flow of ideas within levels of the organizations. Richards (1994:7) points out that "bureaucracy sets up rules about who may communicate with whom; thus, information is often watered down or rendered incomprehensible." The Oklahoma drought plan states that address of the drought situation should occur in a stepwise manner - moving from one level of government to the next. Circumventing the middle man is not encouraged. Another constraint to transfer of knowledge is the rapid turnover in many agencies - esp. in volunteer run organizations such as rural fire departments and local disaster preparedness agencies.

Fifth, the organization must encourage **teamwork.** The teamwork concept generally goes against the bureaucratic model of agency and division rivalries. Organization leaders should facilitate development of group objectives and investigate ways to foster trust and interdependence between employees of all divisions at all levels (Richards, 1994). It's hard to argue that Oklahoma used teamwork in its mitigation since it called on agencies which no longer existed or who did not know their part in the mitigation effort. Teamwork is not to be confused with collaboration. Some agencies in Oklahoma did collaborate with others, such as the National Guard assisting the Department of Agriculture with the Hay Lift when directed by Governor Keating. Teamwork includes innovation of ideas and development of group objectives. It is accomplished from beginning to end by interaction, in this case, of agency to agency.

In some areas, no discernible learning occurred. The issue of water rationing is one of these. Too lax water rationing in the 1995-96 drought brought about water shortages that threatened fire response and caused health issues. The same measures implemented in 1998 returned the same results. Oklahoma experienced some surface level learning of the single loop type which means that errors were detected and corrected. An example of this occurred when the ODA Forestry Services began using J.D. Carlson's Fire Danger Model in fire prediction toward the end of the 1995-96 drought. The agency recognized that existing indices and models did not provide necessary information and implemented use of a model that did provide the needed data. However, the state did not experience double loop learning which requires the organization looks beyond the fixed content to examine underlying goals and objectives to see if they should be changed. In example, Australia experienced double loop learning when it altered government policy in relationship to agricultural assistance. That government, recognizing that droughts are an inevitable part of the its country's climate requires that its agricultural community incorporate the inevitability of drought as a part of normal risk management planning. It provides financial assistance to farmers only when an area experiences "exceptional drought circumstances (NDMC, 1995)."

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Appendix A
Mitigation Details of Oklahoma's Drought Plan

The Oklahoma Drought Management Plan, prepared by the Oklahoma Drought Management Team, outlines the mitigation process for drought in Oklahoma. It provides, in extremely generalized terms, the reactions the government will take when a drought event occurs. The author's of the Oklahoma Drought Contingency Plan describe previous state and local response to drought episodes as crisis management and admit the ineffectiveness of stopgap measures in mitigating both the short- and long-term impacts of drought.

Adopted by Governor by letter of promulgation in August 1997, the Governor directs "the head of each designated department and agency to take the necessary actions to implement it (the drought management plan) by developing written internal procedures that detail support required by the plan and being prepared to put the plan into action." The Governor designated the Director of the Department of Civil Emergency Management as the responsible official to assist the Governor in coordinating State operations.

Prepared as part of Oklahoma's Emergency Preparedness Planning effort, the drought contingency plan delineates appropriate response actions for districts, cities, counties, state agencies and the federal government. It describes and suggests primary lines of authority and responsibility, and details the request procedures for state and/or federal assistance. The ODMT recommends utilization of the plan in conjunction with the State Emergency Operations Plan.

The state drought action plan's general response mechanism states that drought response normally progresses from the individual to the closest level of government. Only when the response capability of each level has been exhausted or exceeded should the next level of response be pursued. Lateral assistance and exchange of information occurs at the individual/city/district, county and/or state level. During drought emergencies, parallel lines of communication are established between individuals and local governmental and other drought response entities

through:

- ☑ county and state U.S. Department of Agriculture emergency boards to the USDA
- ☑ state agencies and their district, local or field offices
- ☑ local emergency management organizations and the State Department of Emergency Management.

In addition to communications pathways and request procedures, the plan outlines the phased approach Oklahoma's response effort follows as water conditions deteriorate. The four phases are:

- ☑ advisory
- ☑ alert
- ☑ warning
- ☑ emergency.

Thresholds have been established so each phase triggers predefined actions in appropriate agencies and organizations.

The plan uses a combination of indices and related factors to determine what phase to trigger. The indices/factors used by ODMT to determine progressive drought stages are:

- ☑ Crop Moisture Index
- ☑ Keetch-Byram Drought Index
- ☑ Major/Minor Reservoir Storage and Public Water Supply
- ☑ Palmer Drought Severity Index
- ☑ Precipitation
- ☑ Reclamation Drought Index
- ☑ Standardized Precipitation Index
- ☑ Streamflows
- ☑ Water Well Levels.

ODMT has also been considering computer models of river and reservoir systems, such as the hydrologic and reservoir simulation models in use by the Bureau of Reclamation and Army Corps of Engineers.

The drought management team began meeting in September of 1996. As per Wilhite's drought planning framework, the ODMT formed three committees, the Water Availability and Outlook Committee (WAOC) and the Impact Assessment and Response Committee (IARC). The Interagency Coordinating Committee

(ICC), comprised of WAOC and IARC representatives, assumes the overall drought response role during emergency phase, including intergovernmental coordination and media relations throughout the emergency phase. Subsequent meetings focused on the current drought-related capabilities of respective members. The drought plan defines the duties and responsibilities of the drought management team, each of its committees and drought coordinator. The overall duty of the ODMT is to make the official determination in activating a specified drought stage in a particular climate division or region.

The duties of the drought coordinator include:

- ☑ brief the governor
- ☑ request specific actions requiring authorization of the state's executive branch
- ☑ request convening the drought team or its committees
- ☑ request individual meetings with committee chairs or individual members to discuss specific
- ☑ aspects of the state's drought planning and response activities
- ☑ review available information for deteriorating moisture conditions and the likelihood for drought emergency
- ☑ request informal assistance and advice from individual weather, climate and water resource representatives of the drought team in an advisory phase
- ☑ activate WAOC when at least one climate division enters alert phase
- ☑ activate Impact Assessment and Response Committee
- ☑ meet with WAOC chairs and IARC to outline activities in warning stage
- ☑ direct and coordinate activities of ICC
- ☑ request that the governor (on behalf of the state) pursue formal drought mitigation assistance
- ☑ or use other extraordinary powers or options allowed through state of emergency declaration, if proclaimed.

The WAOC's duties as defined in the drought plan are:

- ☑ develop and maintain a systematic and efficient monitoring mechanism especially of hydrologic and weather views
- ☑ a sub-group of WAOC keeps the DC continuously apprised of water/moisture contingency conditions before and after drought episodes
- ☑ monitor current water availability and moisture conditions and provide estimates of near future water supply for agricultural, municipal, industrial and power uses
- ☑ correspond monthly via teleconference, e-mail or other informal

communications

- ☑ hold informal meetings monthly to keep abreast of water and moisture related conditions and/or problems
- ☑ conduct evaluation of status or outlook prior to summer/peak water demand months
- ☑ during alert phase convene regular (at least monthly) formal meetings to assess drought trends and projections
- ☑ prepare for the Governor's signature the "memorandum of Potential Drought Emergency" that activates IARC in warning phase
- ☑ submit to DC and drought team a report following each meeting
- ☑ disseminate relevant information to the media primarily through the Oklahoma Water Resources Bulletin.

The Impact Assessment and Response Committee's duties are:

- ☑ continuous oversight of drought impacts on various economic, environmental and social sectors
- ☑ initiate appropriate drought response within the capabilities of the ODMT
- ☑ assess and identify specific unmet needs that cannot be addressed through existing state channels
- ☑ submit report following each meeting to the DC and ODMT members describing the state's current drought impact situation and providing associated recommendations
- ☑ define drought impacts
- ☑ develop policy related aspects of drought response
- ☑ prepare the state drought emergency proclamation for the Governor's signature in an Emergency phase.

The Governor's proclamation activates the Interagency Coordinating Committee. Once the ICC has been activated, IARC transfers the drought response and coordination role of the drought team to the ICC. The drought coordinator selects the members of the Interagency Coordinating Committee, which consists of senior managers of lead drought response agencies in the state government. The drought coordinator also chairs the ICC.

The Interagency Coordinating Committee's duties are:

- ☑ determine which drought-related needs of the state can be met by reallocation of existing resources
- ☑ make appropriate recommendations to DA and Governor
- ☑ assemble supporting data on behalf of the Governor for preparation of a request proclamation for a presidential drought/disaster declaration

☑ prepares end to the drought emergency proclamation
☑ prepares final report of emergency phase activities, then disbands.

In addition to the duties of the drought team, the plan outlines specific responses possible for many agencies at the local, state and national level but in most cases does not require action. Throughout the document the authors use "wiggle words" (Loving, 1995) such as may or should rather than empowering words such as shall or will which lend strength and regulatory credence to a document. At the local level, the plan addresses seven broad categories of entities and their possible response actions.

County governments

County governments, through emergency management organizations, typically form the first line of response. Their specific possible response actions include:

☑ initiate and conduct emergency water supply operations
☑ request assistance from the state in conducting emergency water supply operations
☑ identify and provide storage for requested water
☑ treat emergency water supplies to ensure suitability for human consumption
☑ designate suitable arrival/distribution points for requested water
☑ provide security for water transportation equipment/water supply
☑ assist the USDA emergency board in equitable distribution of available live stock water supplies from delivery points
☑ accept requests from cities, districts and individual users for assistance in obtaining, transporting or distributing emergency water supplies
☑ provide emergency water services through use of county equipment or resources
☑ obtain equipment, supplies or services when not available from the county through private individuals, commercial or industrial firms, volunteer emergency organizations, or the state or the federal government (through the Oklahoma Department of Emergency Management)
☑ assess ongoing drought conditions throughout county focusing on water supplies
☑ analyze future impact of drought on water supplies and system
☑ provide the future water supply and system analysis to the Oklahoma Drought Management Team
☑ update the future water supply and system analysis frequently and provide

the updates to the ODEM and Oklahoma Drought Management Team

- ☑ may hire private services to obtain equipment, vehicles, and/or expertise when public need is involved
- ☑ (county commissioner) requests, by letter, that the Governor declare a "drought emergency" in the county "due to severe and continuing drought" and that the Governor take action such support for voluntary conservation measures
- ☑ (county commissioner) makes a detailed report of drought conditions to accompany the request letter
- ☑ forward copies of the emergency declaration request to the ODMT and Department of Agriculture
- ☑ request that the Governor forward the drought emergency request to the Secretary of Agriculture.

Individuals and Private Industry

Individuals' and private industry's possible response actions include:

- ☑ providing through lease, sale, other compensation, or donation equipment, such as pipes, pumping plants, emergency generating systems, water purification systems, emergency water containers
- ☑ providing vehicles for transporting potable water supplies
- ☑ providing specialized expertise or skills, including engineering design and construction, well location and drilling, agricultural technical assistance and advice on availability of various consumer services.

Irrigation Districts

Their specific responsibilities/possible response actions include:

- ☑ provide water to members
- ☑ maximize use of available supplies consistent with the member's current allocated water rights
- ☑ supply water to non-members
- ☑ encourage or enforce agricultural water conservation practices
- ☑ request emergency water though the local watermaster's office
- ☑ develop drought plans
- ☑ forward drought plans to the appropriate local emergency management organization and USDA county emergency board.

Rural Fire Protection Departments

Their specific responsibilities/possible response actions include:

- ☑ provide fire protection for members

- ☑ utilize equipment for transporting emergency water
- ☑ prepare an estimate of the impact a drought and associated decreases in water would have on fire protection capabilities
- ☑ provide the estimate to the local USDA county emergency board.

Rural Water Districts and Municipalities

Their specific possible response actions include:

- ☑ provide water protection for domestic and municipal use to members or residents
- ☑ allocate existing water supplies in a manner that maximizes benefits to all users encourage or enforce water conservation practices
- ☑ restrict or curtail secondary uses of water
- ☑ seek various measures to augment existing supplies including justly compensated condemnation
- ☑ provide and distribute emergency water supplies to users
- ☑ (when authorized) provide emergency water to other cities or districts or users outside the district (with additional charges for associated costs)
- ☑ request additional water rights from the local watermaster's office
- ☑ request assistance in providing emergency water on behalf of members or residents through
- ☑ county emergency management organizations except when the district lies within a city, then the request should be made through the city's emergency management organization
- ☑ develop contingency plans to address future supply problems
- ☑ provide the contingency plan to the county emergency management organization
- ☑ obtain assistance with water curtailment plans and water conservation practices from the Oklahoma Department of Environment Quality and Water Resources Board.

USDA Emergency Boards (County)

Their specific responsibilities/possible response actions include:

- ☑ coordinate programs of the Farm Service Agency, Extension Service, Natural Resources Conservation Service and Rural Development
- ☑ process (assistance) requests
- ☑ develop Natural Disaster Damage Assessment Reports (NDDAR)
- ☑ submit NDDARs to the State Emergency Board
- ☑ act as liaison with county government
- ☑ invite representatives of county and local government to emergency board meetings.

Volunteer Relief Organizations

Their specific possible response actions include:

- ☑ provide personnel to distribute emergency drinking water to the aged, handicapped and others unable to transport water from a distribution point
- ☑ hold mass feedings for drought victims when drought conditions prohibit or restrict normal individual preparation and/or delivery of food
- ☑ provide personnel to serve at distribution points for emergency water supplies
- ☑ provide shelter of drought victims evacuated from drought stricken areas
- ☑ provide a referral service for individuals seeking or needing drought assistance.

At the state level, the plan addresses sixteen entities or categories of organization and their possible response actions. The general and governor categories are not actually sections in the plan but the responsibilities were culled from throughout the plan's text when they were mentioned in conjunction with another agency's duties.

Department of Agriculture

Their specific possible response actions include:

- ☑ assist agricultural community in assessing and responding to drought impacts
- ☑ assist the Oklahoma State University Agricultural Extension Service in providing estimates of the agricultural impact
- ☑ provide statistics on the effects of drought on farming and ranching
- ☑ provide estimates of the impact on state forest lands
- ☑ develop and implement plans to limit forest land access
- ☑ work with Oklahoma Department of Emergency Management to obtain federal agricultural-related assistance
- ☑ provide information on the ability of private sector equipment for transporting or storing emergency water supplies
- ☑ transport non-potable emergency water supplies
- ☑ submit recommendations concerning county emergency declaration requests to Water Availability and Outlook Committee
- ☑ chairs the Impact Assessment and Response Committee of the Oklahoma Drought Management Team.

Department of Central Services

Their specific possible response actions include:

- ☑ authorize state agencies to make purchases without following competitive bidding procedures
- ☑ purchase supplies or equipment on behalf of state agencies
- ☑ provide information on emergency water supply equipment available through the private sector.

Climatological Survey

Their specific responsibilities/possible response actions include:

- ☑ accumulate and disseminate of statewide climatological data
- ☑ determine state policy regarding climate-related issues
- ☑ serve as the data collection and dissemination center for the Oklahoma Mesonet
- ☑ maintain an archive of statewide precipitation and temperature data
- ☑ maintain the Oklahoma Fire Danger Model.

Department of Commerce

Their specific possible response actions include:

- ☑ promotes economic development
- ☑ administers federal funds for planning assistance to state agencies, sub-state planning districts and local communities
- ☑ provide estimates on projected loss of jobs due to drought
- ☑ provide information to business and industry on federal loan programs available due to a disaster
- ☑ provides information to business and industry on water conservation.

Conservation Commission

Their specific possible response actions include:

- ☑ develop and administer programs to control and prevent soil erosion
- ☑ develop and administer programs to prevent floodwater and sediment damage
- ☑ develop and administer programs to reduce non-point source pollution
- ☑ develop and administer programs to protect wetlands
- ☑ develop and administer programs to promote conservation, development and utilization of the state's renewable resources
- ☑ provide feedback from 88 conservation districts on drought conditions

☑ monitors water supply pool conditions of upstream flood control projects under its jurisdiction.

Corporation Commission

Their specific possible response actions include:

☑ provides estimates of the impact of ongoing drought on generation of electric power
☑ advises the Governor on reduction needs in allocation of the state's electric power
☑ provide information on the availability of private sector equipment for transporting or storing emergency water supplies.

Department of Emergency Management

Their specific possible response actions include:

☑ coordinates emergency water supply operations of state departments and agencies
☑ coordinates emergency water supply assistance from federal or private resources not
☑ otherwise addressed in local emergency plans
☑ implements and coordinates the development of programs and plans to minimize the effects of disasters and emergency situations
☑ coordinates estimates of drought impact
☑ handles requests from local governments and districts for emergency water assistance
☑ coordinate direct emergency assistance from state agencies relative to emergency treatment,
pipelines and pumping of water
☑ provide information on emergency water supply equipment available through the private sector
☑ provides administrative and coordination services related to a federal major disaster or emergency
☑ advises the Governor of need for a Governor's declaration of state/regional emergency or federal assistance or disaster declarations
☑ drafts the Governor's requests for Presidential "Emergency" or "Major Disaster" declarations
☑ coordinates emergency water supply assistance from federal or private sources not addressed in local emergency plans.

Department of Environmental Quality

Their specific possible response actions include:

- ☑ monitors the drought situation
- ☑ provides estimates of the impact of the drought on water quality
- ☑ maintains direct interaction with public/community water systems
- ☑ issues regular water system/supply status reports during drought
- ☑ maintains fact sheets and news releases on water conservation and related programs.

Department of Health

Their specific possible response actions include:

- ☑ provide lists of bottled water facilities to support public water supplies
- ☑ certify bottled water for human consumption
- ☑ release medical warnings regarding the health effects associated with drought conditions
- ☑ provide list of ice manufacturers.

Military Department

Their specific possible response actions include:

- ☑ provide emergency water treatment
- ☑ provide transportation of water through tank trucks, trailers or other vehicles.

Oklahoma State University Cooperative Extension Service

Their specific possible response actions include:

- ☑ prepare information on agricultural drought management practices, and agricultural and domestic water conservation practices
- ☑ supply management practices information to the public
- ☑ provide (through the USDA Emergency Board) estimates of drought impact on state agriculture
- ☑ provide information on federal assistance to agricultural drought victims.

Department of Tourism and Recreation

Their specific possible response actions include:

- ☑ provide information on the economic and social impacts of drought on state parks, recreation areas and lodges.

Emergency Board (State)

Their specific possible response actions include:

- ☑ coordinate the disaster activities and programs of USDA agencies
- ☑ request, edit and distribute Natural Disaster Assessment Reports from the County Emergency Boards
- ☑ report on drought conditions and anticipated agricultural impacts
- ☑ maintain liaison with state government by informing the Governor, ODEM, ODAG, Drought Management Team of activities and reports
- ☑ invite representatives of ODAG, ODEM, the Governor's office and other appropriate officials to Emergency Board meetings.

Water Resources Board

Their specific possible response actions include:

- ☑ administers surface and groundwater rights in Oklahoma
- ☑ require junior water rights holders to curtail use to satisfy the needs of senior downstream users
- ☑ expedite issuance of water rights requested for emergency water supply purposes
- ☑ assist users in analyzing future water supply situation and identifying alternate water sources and conservation options
- ☑ monitor groundwater levels
- ☑ estimate the effects of drought on groundwater and related water users
- ☑ provide information on state-licensed water well drillers
- ☑ direct the Oklahoma Weather Modification Program to augment rainfall and reduce state hail damage
- ☑ administer State Financial Assistance Program that provides loans/grants for water/wastewater facility improvements
- ☑ Oklahoma Leak Detection Program that provides loans/grants to identify and repair rural water system leaks
- ☑ chair the Water Availability and Outlook Committee
- ☑ publishes the Oklahoma Water Resources Bulletin.

Department of Wildlife Conservation

Their specific possible response actions include:

- ☑ provide estimates of the impact of drought on fish and wildlife resources
- ☑ recommend actions related to maintenance of instream flows for fish protection
- ☑ adjust fishing and hunting regulations to compensate for drought conditions
- ☑ develop and implement alternative procedures for providing food and water for wildlife
- ☑ provide tank trucks, trailers, or other vehicles capable of transporting or storing emergency water.

Oklahoma Rural Water Association

Their specific possible response actions include:

- ☑ provide technical assistance related to capacity, treatment, and distribution problems of 1,000 small water supply systems
- ☑ cooperates with the OWRB in the Oklahoma Leak Detection Program.

Oklahoma Municipal League

Their specific possible response actions include:

- ☑ provide referrals to community systems in need of assistance from other agencies and organizations
- ☑ provide information on current impacts experienced by Oklahoma's municipalities.

Governor

Their specific possible response actions include:

- ☑ directs and controls distribution of water supplies under drought emergency conditions
- ☑ declare a drought emergency in counties experiencing "severe and continuing drought" coordinates State drought related operations
- ☑ request federal assistance when local and state resources are inadequate
- ☑ activate IARC under recommendation from DC and WAOC members in Warning Phase
- ☑ request USDA Emergency Board assistance.

General

Their specific possible response actions include:

- ☑ state government departments and agencies capable of providing emergency water supply assistance will do so when directed by the Governor or his authorized representatives
- ☑ Water Availability and Outlook Committee forwards to the Governor the ODMT and ODAG recommendations concerning county drought emergency declarations.

At the federal level the plan addresses, eighteen organizations and their possible response actions.

The President's section is not actually a section in the plan but the responsibilities

were culled from throughout the plan's text when mentioned in conjunction with another agency's duties.

U.S. Department of Agriculture

Their specific possible response actions include:

- ☑ provide feed, including hay, on a cost-sharing basis through the Emergency Feed Program
- ☑ distribute its publication "Natural Disaster Assistance Available from the USDA" which details the agency's assistance programs.

American Red Cross

Their possible response actions include:

- ☑ cooperate with general community-based response efforts to reduce human suffering or meet basic needs
- ☑ provide technical consultation and guidance to local and state government agencies in planning for the distribution of water from central sites
- ☑ establish and staff first-aid stations at community sites designated for distribution of water
- ☑ coordinate voluntary agency activities designed to support local community response efforts
- ☑ provide voluntary personnel to assist local government response actions.

U.S. Army Corps of Engineers

Their possible response actions include:

- ☑ provide guidance in the preparation of drought contingency plans
- ☑ provide technical assistance and guidance on specific water and related land resource problems
- ☑ provides daily information on the 25 major reservoirs under its jurisdiction
- ☑ provide water in limited and temporary manner once a state drought emergency has been declared
- ☑ pay for transportation costs of water used for human and livestock consumption
- ☑ pay for the installation of water supply wells (repayment to the federal government required).

Bureau of Indians Affairs

Their possible response actions include:

- ☑ represent Native American water rights
- ☑ coordinate various environmental programs on tribal lands.

Bureau of Reclamation

Their possible response actions include:

- ☑ assists in development of and conservation of water, power and related land resources participate in cooperative programs with local and state entities related to water
- ☑ conservation and drought planning
- ☑ provide water level information on seven major Bureau-constructed lakes in Oklahoma (from local operators).

Department of Defense

Their possible response actions include:

- ☑ transport water or drill wells (for human and livestock consumption) for political subdivisions using federal equipment and laborers.

Federal Emergency Management Agency

Their possible response actions include:

- ☑ process requests by the Governor for Presidential "Emergency" and "Major Disaster" declarations.

Farm Service Agency

Their possible response actions include:

- ☑ evaluate agricultural losses
- ☑ provide cost-sharing funds to develop water supplies for grazing livestock through its Emergency Conservation Program
- ☑ assist in preventing wind erosion damage to farmland
- ☑ allow grazing and haying of Conservation Reserve Program lands
- ☑ administers the Non-insured Crop Disaster Assistance Program.

U.S. Fish and Wildlife Service

Their possible response actions include:

- ☑ assists states in planning and developing projects to restore and manage fish and wildlife resources

☑ monitor impacts to instream flows, endangered species, waterfowl and/or effects on federal wildlife refuges.

U.S. Geological Survey

Their responsibilities/possible response actions include:

☑ provide hydrologic information
☑ appraise water resources
☑ provide water information for economic development and best use of water resources
☑ maintain 155 river stage/discharge and lake stage sites
☑ maintain computerized historic data for more than 25,000 sites in Oklahoma
☑ interpret hydrologic data for use by individuals in either the public or private sector.

Department of Health and Human Services

Their possible response actions include:

☑ assist state health officials and other federal officials with (drought) health-related problems
☑ provide advice, guidance and technical engineering assistance in assessing actual or potential health problems and provision of medical care through regional or state offices
☑ provide various financial assistance programs and other human service programs through state/district office of the Social Security Administration
☑ assume a portion or all costs associated with developing projects to relieve older individuals of burdens of costly utility service.

Internal Revenue Service

Their possible response actions include:

☑ allow farmers or ranchers who involuntarily sell more animals than normal to include the income from the sale of the additional animals as income for the following year.

Natural Resources Conservation Service

Their possible response actions include:

☑ provide technical assistance through local conservation districts to farmers, ranchers and local governments
☑ compile reports on short-duration natural phenomena

- ☑ provide field collection, interpretation and publication of natural and related resource data to government agencies, individuals and organizations
- ☑ conserve and develop the soil and water of the Great Plains area by providing technical and financial assistance to farmers, ranchers and others through the Great Plains Conservation Program
- ☑ provide technical and financial assistance to local organizations for planning and implementing small watershed small watershed projects for watershed protection; flood prevention, agricultural water management, recreation, municipal and industrial water supply, and fish and wildlife development
- ☑ assist state and local agencies in collecting decision-making information and developing plans of action regarding water and related land resources through the River Basin Surveys and Investigations Program.

Rural Development

Their possible response actions include:

- ☑ loan farmers funds to establish wells through the Emergency, Soil and Water, Farm Ownership, Watershed and Operating loan programs
- ☑ make emergency loans in counties where natural disaster results in physical property damages and/or severe production losses to farming, ranching or aquaculture operations
- ☑ make loans to governmental bodies to alleviate water shortages in rural areas.

Small Business Administration

Their possible response actions include:

- ☑ offer Economic Injury Disaster Loans to small business and agricultural co operatives dependent on farmers and ranchers as customers.

National Weather Service

Their possible response actions include:

- ☑ provide information on current weather and river stages
- ☑ provide weather forecasts prepared locally through five days and long-term outlook forecasts for six to 10 day, 30 day, 60 day, and 90 day periods.

U.S. Department of Housing and Urban Development

Their possible response actions include:

☑ provide Community Development Block Grants to cities or communities for projects such as construction or repair of water lines, new water wells, and other related construction that would meet existing community needs

☑ waive program requirements so funds may be redirected to emergency situations if requested when a Presidential declaration of disaster is in place.

President

His possible response actions include:

☑ issue an "Emergency" and/or "Major Disaster" declaration.

Other Federal Drought Assistance

☑ Most agencies described in the federal section of the plan can provide drought-related public education and assistance materials.

Appendix B
Mitigation Details of the 1995-96 & 1998 Oklahoma Droughts

Timeline of the 1995-1996 Drought

January 11, 1996

- ☒ Governor Frank Keating requests disaster assistance from the U.S. Department of Agriculture (*Tulsa World,* May 25, 1996)

January 23, 1996

- ☒ President Clinton authorizes the release of 1. 5 million tons of wheat from the Food Security Commodity Reserve to meet humanitarian food aid commitments

January 25, 1996

- ☒ USDA permits farmers with CRP contracts expiring in 1996 to terminate the contracts early and bring the acreages back into production this crop year

February 13, 1996

- ☒ wildfires begin burning throughout the state

February 18, 1996

- ☒ Gov. Keating declares this date a statewide day of prayer for rain and for farmers

February 23, 1996

- ☒ volunteer Fire Chief Nathaniel Quinn of IXL dies of cardiac arrest fighting the blazes in Okfuskee County (*Dallas Morning News*, Feb. 24, 1996)
- ☒ two dozen fire departments converge in Woods County to battle a 12 mile wide inferno that consumed 200,000 acres (*Saturday Oklahoman Times,* Feb. 24, 1996)
- ☒ Creek County officials declare an emergency which enabled crews to share equipment and the county to seek federal aid
- ☒ Gov. Frank Keating declares a fire emergency in all 77 Oklahoma counties, making state assets available to local jurisdictions
- ☒ officials activate the State Emergency Operations Center (Oklahoma Department of Civil Emergency Management)
- ☒ Federal Emergency Management Agency approves a fire suppression grant for Perry, Stillwater, Perkins and the surrounding area (*Dallas Morning News,* Federal Emergency Management Agency)
- ☒ American Red Cross establishes family service center at First Baptist Church in Bristow (*Tulsa World)*

February 24, 1996

- ☒ 34 Oklahoma counties report fires
- ☒ Oklahoma agriculture officials report 21 active fires across the state
- ☒ Civil Air Patrol deploys two aircraft as airborne communication relay units so firefighters may use hand held radios to communication throughout the

22-county area under siege

- ☒ Gov. Frank Keating declares an outdoor burn ban for all 77 counties (*Dallas Morning News*)
- ☒ Highway Patrol closes a seven-mile stretch of Interstate 44 north of Lawton due to fires (*Dallas Morning News*)
- ☒ HP closes a 12 mile stretch of Interstate 35 near Perry (*Dallas Morning News*)
- ☒ a Cushing and an Ingalls fire truck collide on State Highway 51 in dense smoke crushing the legs of two firefighters who were riding on the platform on the front of the Cushing truck (*Stillwater News Press*, February 25, 1996)
- ☒ fires burn an Okemah Fire Department tanker (*Saturday Oklahoman Times*)
- ☒ Okfuskee County officials close U.S. Highway 62 and State Highway 48 (*Saturday Oklahoman Times*)
- ☒ Oklahoma Civil Emergency Management opens a wildfire command center in Oklahoma City to coordinate federal and state mitigation efforts (*Saturday Oklahoman Times*)
- ☒ state officials activate the South-Central Forest Fire Protection Compact, allowing the sate to use U.S. Forest Service equipment and personnel (*Saturday Oklahoman Times*)
- ☒ Insurance commissioner John P. Crawford declares a state of emergency, which sets up procedures to issue licenses to emergency adjusters (*Saturday Oklahoman Times*)

February 25, 1996

- ☒ Creek County loses 32 homes to the fires (*The Sunday Oklahoman*)
- ☒ fires destroy a 50-square-mile ring of area surrounding Bristow (*The Sunday Oklahoman)*
- ☒ state officials report losses of 54 homes and more than 250,000 acres from February 23rd's fires (*Tulsa World)*
- ☒ Red Cross closes Bristow service center (American Red Cross)
- ☒ Oklahoma Army National Guard provides a helicopter with water bucket to fight the Sperry-Skiatook-Barnsdall Fire Complex
- ☒ Red Cross reports damage in 11 counties: Pittsburg, Delaware, Payne, Blaine, Oklahoma, Pottawatomie, Cleveland, Carter, Okfuskee, Tulsa, Creek (*Tulsa World)*
- ☒ KinderDozer Service, City of Stillwater, and Carrier Equipment loaned bull dozers to cut fire breaks in the Perry fires
- ☒ Big J Oil Company provided two water tanker trucks, while OSU Forestry Service provided one in the Perry fires
- ☒ Oklahoma Department of Agriculture Forestry Division release precautions for rural home owners to reduce the risk of wildfire damage
- ☒ FEMA director James Lee Witt approves use of federal funds to aid firefighting efforts
- ☒ the federal Incident Command Team arrives to assist in firefighting, bringing 150 personnel, 12 fire trucks, two water-carrying helicopters, two air

- tankers with 1,000 gallon water capacity and spotter planes

February 26, 1996

- OCEM reports 400,000 acres or 1 percent of the state burned since Feb. 13
- 800 rural fire departments remain on 24 hour duty

February 28, 1996

- February of 11996 becomes the driest since record keeping began in 1892

March 1, 1996

- OCEM reports it established new strike team centers at National Guard armories in Bartlesville and Stillwater

March 2, 1996

- Oklahoma Civil Air Patrol deploys two aircraft to Ada as airborne communication units

March 5, 1996

- a group of Alva landowners files a lawsuit against Alfalfa Electric Cooperative Inc., alleging fires that destroyed 200,000 acres started from an AECI truck used as a power source

March 7, 1996

- President Clinton ordered additional federal aid for firefighting resources in Oklahoma

March 11, 1996

- more than 4,000 acres burn in 46 separate wildfires across the state (*The Daily Oklahoman*)

March 12, 1996

- wind erosion reports show 1.8 million acres in western Oklahoma at risk for serious wind erosion; the amount of land in "condition to blow" is at a twenty year high (U.S. Department of Agriculture)
- FEMA approved two additional Federal Fire Suppression grants for the Sperry-Owasso and Little Axe fire complexes (Oklahoma Department of Civil Emergency Management)

March 13, 1996

- firefighters from 10 departments battled an eight square mile blaze that forced the temporary closure of U.S. 75 and Oklahoma 20 in Oklahoma County (*Tulsa World*)
- the Oklahoma National Guard provides Blackhawk helicopters to combat the blaze (*Tulsa World*)
- fires in Taft destroyed three homes (*The Daily Oklahoman*)

- ☒ three firefighters and one Tulsa County sheriff's deputy suffered injuires while combating the blazes (The Daily Oklahoman)

March 14, 1996

- ☒ the Creek County Hay Relief Project receives 400 bales of hay from Missouri farmers but needs drivers and trucks to distribute it (Oklahoma Department of Agriculture)
- ☒ Burlington Northern Railroad provides railcars to transport hay from Oklahoma to Missouri

March 15, 1996

- ☒ OASS reports precipitation levels less than half of normal in multiple regions (6 month report)
- ☒ Governor considers using Rainy Day Funds to conduct cloud seeding
- ☒ OCEM reports wildfires burned 600,000 acres since Feb. 13
- ☒ OCEM reports destroyed or damaged 50+ homes
- ☒ OCEM reports caused two deaths and 12 injuries
- ☒ OCEM reports property loss of $1.4 million (*The Daily Oklahoman)*

April 5, 1996

- ☒ Glickman implements a legislative provision that allows farmers with certain CRP lands enrolled in the program at least five years to terminate their CRP contracts early and return the acreage to production

April 10, 1996

- ☒ Secretary of Agriculture Dan Glickman extends the deadline to purchase catastrophic risk crop insurance coverage for spring-planted crops to May 2, providing an additional four weeks

April 26, 1996

- ☒ Secretary of Agriculture Dan Glickman authorizes emergency grazing on Conservation Reserve Program lands in selected areas
- ☒ Glickman reduces CRP rental payments by 5 percent each month CRP acreage is grazed

April 30, 1996

- ☒ President Clinton directs Glickman to open all but the most environmentally sensitive CRP lands for emergency grazing

May 7, 1996

- ☒ grain officials estimate state crop at 74.1 bushels, the lowest in 25 years (*Enid News & Eagle*)

May 8, 1996

- ☒ U.S. Department of Agriculture responds to governor's drought disaster

assistance request; the state is designated as a primary disaster area (*Tulsa World,* May 25, 1996)

May 9, 1996

- ☒ Panhandle ranchers like drought to Dust Bowl era after receiving an average rainfall of 2.32 inches since October 1995 (*Tulsa World*)

May 10, 1996

- ☒ farmers interviewed by media say they'd have been better off betting in Las Vegas than on the season's crops (*Associated Press*)
- ☒ members of the media criticize Palmer Drought Severity Index (*Enid News & Eagle*)
- ☒ Oklahoma Agriculture Secretary Dennis Howard estimates that 50 percent of Oklahoma's 70,000 farmers and ranchers will not make their July 1 mortgage payment (*The Journal Record*) and that between 1,000 and 10,000 farmers will default on loans (*McAlester News-Cap & Democrat*)
- ☒ US Secretary of Agriculture recognizes Oklahoma drought crisis (*McAlester News-Cap & Democrat*)
- ☒ milk prices predicted to rise 20 to 25 cents (*Enid News & Eagle*)

May 13, 1996

- ☒ Clinton Ministerial Alliance sponsored the Prayer Vigil for Rain (*Clinton News*)

May 20, 1996

- ☒ two and a half to five inches of rain falls on Oklahoma but Todd Lindley of the National Weather Service says only an inch per day for the next ten days could alleviate the drought conditions still prevalent (*Tulsa World*)

May 23, 1996

- ☒ Secretary of Agriculture Dan Glickman transferred $56 million into the emergency farm loan account from the Conservation Reserve Program for loans to farmers and ranchers affected by the drought (USDA)
- ☒ Federal Emergency Management Agency Director James Lee Witt names FEMA Region VI Director R.L. "Buddy" Young chair of the multi-state drought task force (FEMA)
- ☒ Glickman authorizes the Uninsured Assistance Program to cover losses on small grains used for forage

May 25, 1996

- ☒ Federal Emergency Management Agency calls for its multistate task force to meet in the last week of June

May 26, 1996

- ☒ Oklahoma Agriculture Secretary Dennis Howard reports that farm bankruptcies in the Western District are up 40 percent from a year ago and

Farm Service delinquency rates have tripled (*The Duncan Banner*)

- ☒ ranchers selling cattle at Beaver City Stockyards receive $350 per head, as opposed to last year's $800 per head (*The Sunday Oklahoman*)
- ☒ state agriculture officials report that the drought has caused $1.2 billion in economic loss (*McAlester News-Cap & Democrat*)

May 30, 1996

- ☒ President Clinton orders $70 million in federal assistance for drought assistance (*Associated Press*)
- ☒ U.S. Agriculture Secretary Dan Glickman requests White House permission to release 48 million bushels of grain held in government reserve to aid livestock producers (*Associated Press*)
- ☒ the U.S. Small Business Administration makes Economic Injury Disaster Loans available to agri-businesses depending on farmers and ranchers in Oklahoma

June 1, 1996

- ☒ Sen. Don Nickles visits farms in north-central Oklahoma to survey damage (*Guymon Herald*)

June 2, 1996

- ☒ USDA extends coverage of its non-insured crop disaster assistance to grain producers suffering major small grain and forage crop losses (*Kingfisher Times & Free Press*)
- ☒ OSU agricultural meteorologist J.D. Carlson reports that It will take 20 inches of rainfall to end the drought (*Tulsa World*)
- ☒ Tulsa reports a pumpage of 133 million gallons per day for the third week of May and 105 million gallons per day for the final week of May - normal usage is 86 million gallons per day (*Tulsa World*)

June 25, 1996

- ☒ with 80 percent of the wheat reaped Oklahoma turns in its smallest harvest in 25 years (Oklahoma Department of Agriculture)
- ☒ the drought causes the abandonment of one million acres (Oklahoma Department of Agriculture)

June 26, 1996

- ☒ heavy rains bring 65 percent of the state's topsoil to adequate moisture level, according to Oklahoma Agricultural Statistics Service (*Tulsa World*)
- ☒ wheat producers have harvested 87 percent of the season's crop (*Tulsa World*)

July 1, 1996

- ☒ President Clinton declares the Southwest and other areas of the U.S. in a state of emergency that warrants the release of the Feed Grain Disaster

Reserve

☒ Agriculture Secretary Dan Glickman announces the availability of $40 million in assistance for livestock producers to purchase feed

July 7, 1996

☒ Oklahoma state Senator Stratton Taylor requests drought assistance for Rogers and Mayes counties from State Agriculture Secretary Dennis Howard (*Pryor Times*)

July 8, 1996

☒ the Oklahoma Water Resources Board reports the average rainfall deficit in Oklahoma since October 1, 1995 is 10.30 inches

July 10, 1996

☒ a three-day rain begin pelting the state causing floods and breaking the triple-digit heat wave (*Alva Review-Courier*, July 12)

☒ Oklahoma City receives 2.79 inches of rainfall shattering the previous daily (*Alva Review-Courier*, July 12)

☒ precipitation record of 1.9 inches set in 1945 (*Alva Review-Courier*, July 12)

July 11, 1996

☒ rain continues to pelt the state causing roads to flood and stranding motorists where their cars stalled (Alva Review-Courier, July 12)

☒ Spencer records 6.82 inches of rain in 16 and one-half hours (Alva Review-Courier, July 12)

☒ Oklahoma City reports record rainfall of 2.67 inches in nice hours, breaking a record that had stood since 1906 (Alva Review-Courier, July 12)

☒ Oklahoma City reports 42 traffic accidents due to weather conditions; the average is 10 to 12 per day (*Alva Review-Courier*, July 12)

July 12, 1996

☒ an 11-foot rise reported on the Canadian River near Oklahoma City

August 27, 1996

☒ Gov. Frank Keating forms the Oklahoma Drought Management Team to monitor and provide assistance in future drought situations

December 31, 1996

☒ the year's wheat yield dipped to 93.1 million bushels from an average of 150 million bushels (*Hugo News*)

January 6, 1997

☒ deadline to apply for the U.S. Small Business Administration's Economic Injury Disaster Loans

February 3, 1997

☒ governors of North Dakota, New Mexico, Colorado, Arizona and Texas and Secretary of Agriculture and Secretary of the Interior form the state/federal Drought Policy Coordination Council to plan for and implement drought relief measures

August 4, 1997

☒ Oklahoma Drought Management Team considers adopting the final Drought Management Plan

Timeline of the 1998 Drought

June 13, 1998

☒ U.S. Department of Agriculture forecasts the sixth largest wheat harvest for Oklahoma (*The Daily Oklahoman*)

June 29, 1998

☒ Governor Frank Keating requests a federal agriculture drought declaration for 31 counties (*The Daily Oklahoman,* June 30, 1998*)*

☒ Keating issues a burn ban for 10 counties (*The Daily Oklahoman*)

☒ topsoil moisture hit its lowest level since May 1996 (*The Daily Oklahoman*)

☒ subsoil moisture hit its lowest level since July 1996 (*The Daily Oklahoman*)

June 30, 1998

☒ Governor Keating issues a burn ban for 15 counties: Cimarron, Texas, Beaver, Harper, Woodward, Ellis, Dewey, Roger Mills, Custer, Beckham, Washita, Kiowa, Greer, Harmon, Jackson (Office of Governor Frank Keating)

July 2, 1998

☒ Gov. Frank Keating asks President Clinton to resume using export enhancement funds to boost wheat prices

July 7, 1998

☒ Mustang uses one-third of its water supply battling an oil tanker explosion; the city purchases 13 million gallons of water from Oklahoma to keep water supply at a safe levels

July 10, 1998

☒ Gov. Keating lifts the burn ban in nine counties: Cimarron, Texas, Beaver, Harper, Woodward, Willis, Dewey, Roger Mills, Custer

July 11, 1998

☒ Grady County Rural Water District No. 3 enacts mandatory water rationing

☒ Norman enact mandatory water rationing

- ☒ Piedmont enacts mandatory water rationing
- ☒ Mustang enacts odd-even water rationing
- ☒ Clayton enacts mandatory water rationing
- ☒ Bryan Rural Water District No. 2 enacts mandatory water rationing
- ☒ Cheyenne implements voluntary rationing
- ☒ Edmond implements voluntary rationing
- ☒ El Reno implements voluntary rationing
- ☒ Maud implements voluntary rationing
- ☒ Moore implements voluntary rationing

July 13, 1998

- ☒ Oklahoma City implements emergency odd-even water rationing after a 72-inch water main from Lake Stanley Draper , the city's main water supply, breaks
- ☒ Mustang enacts an outdoor watering ban when resident usage tops 2 million gallons per day

July 14, 1998

- ☒ Duncan enacts a water rationing plan

July 15, 1998

- ☒ Governor Frank Keating requests disaster declaration from the U.S. Department of Agriculture for 29 more Oklahoma counties (*The Daily Oklahoman*)
- ☒ Keating sets a press conference for 10 a.m. July 17 to discuss drought conditions and planned responses
- ☒ Gov. Frank Keating adds 29 more counties to the list submitted to the U.S. Department of Agriculture for disaster designation

July 16, 1998

- ☒ Oklahoma Congressman meet with representatives from the state's major farm organizations (*Tulsa World*)
- ☒ El Reno, OK imposes a mandatory odd-even water rationing system (*The Daily Oklahoman*)

July 17, 1998

- ☒ State Civil Emergency Management Department reports that the state is at stage two - alert stage of the Oklahoma Drought Plan (*Tulsa World*)
- ☒ Oklahoma City issues ozone alert for the day
- ☒ Oklahoma Agriculture Commissioner Dennis Howard reports that the drought has cost state farmers and producers $2 billion (*The Daily Oklahoman*)

July 18, 1998

- ☒ Oklahoma Congressmen propose that USDA make advance transition payments to farmers (*The Daily Oklahoman*)

- ☒ OKC West Livestock Market reports weekly sales of 4,000 to 5,000 head per week, compared to the previous year's average of 2,500 per week (Ranchers attributed the increased sales to increased feed costs due to lack of feed grains and water.) (*The Daily Oklahoman*)
- ☒ U.S. Senate passes a $500 million emergency funding for farmers suffering repeated hardships (*The Daily Oklahoman*)
- ☒ a horde of grasshoppers invade Oklahoma from the Texas border (*The Daily Oklahoman*)
- ☒ Governor Keating asks religious leaders to hold a day of prayer (*The Daily Oklahoman*)

July 19, 1998

- ☒ President Clinton announces the U.S. government will buy $250 million worth of surplus wheat to donate to foreign countries in need (*Lycos News*)

July 20, 1998

- ☒ Cleveland county Farm Services Agency estimates a 90 percent agricultural loss in its DAR (*The Norman Oklahoman*)
- ☒ Oklahoma Department of Agriculture Wildfire Assessment Teams examine conditions is southern Oklahoma to determine the drought's severity and the need for burn bans

July 21, 1998

- ☒ Oklahoma City residents set a consumption record of 166.2 million gallons of water while under a mandatory water rationing plan

July 22, 1998

- ☒ Gov. Keating expands the state burn ban to 29 additional counties bringing the total number under the ban to 35 (*The Norman Transcript*, Office of Governor Frank Keating)
- ☒ Edmond enacts mandatory odd-even rationing for outdoor water usage (*The Daily Oklahoman*)
- ☒ Oklahoma Department of Agriculture Market Development Services establishes a toll-free hay hotline to match hay sellers and buyers

July 23, 1998

- ☒ President Clinton announces $100 million in emergency aid to Oklahoma and 10 other states suffering heat waves
- ☒ Oklahoma Department of Agriculture's Market Services announces its toll-free hay hotline through which buyers and sellers can make contact (*Tulsa World*)
- ☒ Ardmore city manager Blaine Hines reports that crews repair two to three water-main breaks a day (*The Daily Oklahoman*)
- ☒ Seminole firefighters battle four to five fires daily (*The Daily Oklahoman*)
- ☒ Cromwell and Wetumka firefighters battle an average of two wildfires per

week (*The Daily Oklahoman*)

- ☒ Wewoka firefighters battle two to three wildfires per week (*The Daily Oklahoman*)
- ☒ Edmond enacts a fine of up to $100 for water ration violators after residents used 22 million gallons of water on July 22, exceeding the city's capacity by 1.5 million gallons (*The Daily Oklahoman*)
- ☒ El Reno enacts no outdoor watering (*The Daily Oklahoman*)
- ☒ Maud enacts voluntary water rationing (*The Daily Oklahoman*)
- ☒ Moore enacts mandatory odd-even rationing for outside water uses (*The Daily Oklahoman*)
- ☒ Mustang enacts an outdoor watering ban (*The Daily Oklahoman*)
- ☒ Newcastle enacts an outdoor watering ban (*The Daily Oklahoman*)
- ☒ Norman retools its water rationing plan to ban all outdoor watering on Mon days to allow system recharge (*The Oklahoma Daily*)
- ☒ Oklahoma City toughens enforcement of its mandatory odd-even rationing; it will issue warnings but not tickets for violations (The *Daily Oklahoman*)
- ☒ Piedmont enacts mandatory odd-even rationing for outdoor watering (*The Daily Oklahoman*)
- ☒ Union City enacts an outdoor watering ban (*The Daily Oklahoman*)
- ☒ The Village enacts odd-even rationing for outdoor watering (*The Daily Oklahoman*)
- ☒ Yukon enacts a two day outside watering ban; returns to mandatory odd-even watering (*The Daily Oklahoman*)
- ☒ Cherokee and Cushing enact voluntary watering bans (*The Daily Oklahoman*)
- ☒ the drought/heat wave death toll rises to 13 (*The Daily Oklahoman*)

July 24, 1998

- ☒ the drought/heat wave death toll rises to 15 (*The Daily Oklahoman*)
- ☒ Lawton begins drawing from its secondary water source at Lake Ellsworth due to drain on Lake Lawtonka
- ☒ Norman bans outdoor watering at municipal facilities and enacts a voluntary ban for institutional customers due to heavy overnight water usage
- ☒ the Department of Agriculture Fire Prevention Task Force meets with western Oklahoma fire fighters and officials to determine drought severity

July 25, 1998

- ☒ the Oklahoma Agriculture Statistics Service reports 44 percent of Oklahoma pasture rates poor to very poor (*The Daily Oklahoman*)
- ☒ U.S. Senate approves $500 million for drought relief (*The Daily Oklahoman*)

July 26, 1998

- ☒ Grasshopper plague invades Oklahoma farms - too mature to be sprayed for, the insects eat every plant they can find, then move onto items such as nylon window screens (*The Daily Oklahoman*)
- ☒ U.S. Secretary of Agriculture Dan Glickman declares 66 of Oklahoma's 77 counties disaster areas (*The Daily Oklahoman*)
- ☒ Agriculture Secretary Dan Glickman designates 66 of Oklahoma's 77 counties disaster areas due to the drought
- ☒ the Oklahoma Department of Agriculture's Forestry Services Division expands the Oklahoma Red Flag Fire Alert to cover 36 of Oklahoma's 77 counties

July 27, 1998

- ☒ Oklahoma City sets a daily water consumption record -171.8 million gallons (*The Daily Oklahoman*)
- ☒ Oklahoma City issues no citations for violations its rationing plan - only warning tickets (*The Daily Oklahoman*)
- ☒ July wildfires destroyed more than 2,100 acres of timber and caused more than $5 million in timber, houses and other structures forestry officials report

July 28, 1998

- ☒ U.S. Secretary of Agriculture Dan Glickman tours Oklahoma farms (*The Norman Transcript*)
- ☒ Glickman extends the deadline for emergency grazing on Conservation Reserve Program lands to November 30, 1998
- ☒ the state's Drought Management Team meets and adds three members -the state Department of Human Services, state medical examiner's office and Oklahoma-Arkansas Division of the Salvation Army (*The Daily Oklahoman*)
- ☒ Gov. Frank Keating and U.S. Agriculture Secretary Dan Glickman tour three Oklahoma farms affected by the drought
- ☒ Keating designates August 2-8, 1998 as "Drought and Wildfire Awareness Week"

July 29, 1998

- ☒ U.S. Secretary of Agriculture Dan Glickman says crop insurance reforms needed to provide agricultural safety net (*The Norman Transcript*)
- ☒ Glickman approves 17 Oklahoma counties' ranchers to produce hay and graze cattle on Conservation Reserve Program lands (*The Dallas Morning News*)
- ☒ drought/heat wave death toll rose to 17 (*The Daily Oklahoman*)
- ☒ the Department of Human Services announces it will begin taking applications on August 3 for $4.3 million in emergency aid to pay for air conditioners, fans and electricity bills (*The Norman Transcript*)
- ☒ state Rep. Mike Mass of Hartshorne, requests that Gov. Keating activate the National guard to transport hay to agricultural producers (*The Norman*

Transcript)

- ☒ Governor Keating proclaims the week of August 2-8 "Drought and Wildfire Awareness Week" (*The Daily Oklahoman*)
- ☒ Yukon begin assessing $100 fines for violations of the city's mandatory water restrictions (*The Daily Oklahoman*)
- ☒ El Reno begin assessing $35 fines for violations of the rationing plan (*The Daily Oklahoman*)
- ☒ Norman toughens its rationing plan and begins issuing warning tickets (*The Daily Oklahoman*)
- ☒ Adamson enacts voluntary water conservation (*The Daily Oklahoman*)
- ☒ Bryan county enacts mandatory no lawn watering (*The Daily Oklahoman*)
- ☒ Centrahoma, Clarita-Olney, Coalgate enacts mandatory no lawn watering (*The Daily Oklahoman*)
- ☒ Cheyenne enacts voluntary water conservation (*The Daily Oklahoman*)
- ☒ Clayton enacts mandatory no lawn watering (*The Daily Oklahoman*)
- ☒ Duncan enacts mandatory odd-even rationing for outdoor watering (*The Daily Oklahoman*)
- ☒ Edmond enacts mandatory odd-even rationing (*The Daily Oklahoman*)
- ☒ Grady county enacts voluntary no outside watering (*The Daily Oklahoman*)
- ☒ Kingston enacts mandatory no outside watering (*The Daily Oklahoman*)
- ☒ Latimer county enacts voluntary water conservation (*The Daily Oklahoman*)
- ☒ Laverne enacts precautionary rationing (no outside watering from 2 p.m. to 8 p.m. (*The Daily Oklahoman*)
- ☒ Maud enacts voluntary water rationing (*The Daily Oklahoman*)
- ☒ McLoud enacts mandatory no outside watering (*The Daily Oklahoman*)
- ☒ Minco enacts mandatory no outside watering (*The Daily Oklahoman*)
- ☒ Moore enacts mandatory rationing (odd-even lawn watering) (*The Daily Oklahoman*)
- ☒ Mustang enacts mandatory rationing and no outside watering except on an odd-even basis between midnight and noon (*The Daily Oklahoman*)
- ☒ Newcastle enacts mandatory no lawn watering (*The Daily Oklahoman*)
- ☒ Nowata enacts mandatory water rationing (*The Daily Oklahoman*)
- ☒ Okeene enacts mandatory odd-even rationing (*The Daily Oklahoman*)
- ☒ Pauls Valley enacts mandatory odd-even rationing (*The Daily Oklahoman*)
- ☒ Piedmont enacts mandatory odd-even rationing for outdoor watering (*The Daily Oklahoman*)
- ☒ Pittsburg county enacts mandatory no outside watering (*The Daily Oklahoman*)
- ☒ Pushmataha county enacts voluntary rationing (*The Daily Oklahoman*)
- ☒ Seminole enacts mandatory odd-even outdoor watering (*The Daily Oklahoman*)
- ☒ Union City enacts mandatory rationing with limited odd-even outdoor watering (*The Daily Oklahoman*)
- ☒ The Village enacts mandatory odd-even rationing (*The Daily Oklahoman*)

- ☒ Wilburton enacts mandatory water conservation (*The Daily Oklahoman*)
- ☒ Woodward enacts mandatory odd-even water rationing (*The Daily Oklahoman*)
- ☒ Yukon enacts mandatory odd-even water rationing (*The Daily Oklahoman*)
- ☒ Broken Bow's mayor declares a limited fire emergency due to two wildfires in the Broken Bow area - one of 1,000 acres, the other of 2,000 acres (*The Norman Transcript*)
- ☒ U.S. Forest Service drops flame retardant on both fires but they continue to burn throughout the night (The *Norman Transcript*)

July 30, 1998

- ☒ Gov. Keating activates the National Guard to deliver hay to agricultural producers (*The Norman Transcript*)
- ☒ Gov. Keating sends letters to the governors of Missouri, Kansas, Arkansas and Colorado (*The Daily Oklahoman*)
- ☒ Gov. Keating adds 13 counties to the 35 already under a mandatory burn ban (*The Dallas Morning News*, July 30, 1998)
- ☒ Oklahoma City logs its 12th day in a row of 100 degree or above heat (*The Daily Oklahoman*)
- ☒ Broken Bow closes airport to accommodate firefighting efforts only (*The Daily Oklahoman*)
- ☒ 200 firefighters from the U.S. Forest service, state Department of Agriculture's Forestry service, the Bureau of Indian Affairs and volunteer fire departments battle the blazes (*The Daily Oklahoman*)

July 31, 1998

- ☒ U.S. Agriculture Secretary Dan Glickman tells the U.S. House Agriculture Committee that the proposed $500 million in drought aid will not suffice - either more funds are needed or eligibility for them must be tightened (*The Daily Oklahoman*)
- ☒ City leaders of Oklahoma City, Edmond, Norman, Mustang, Piedmont, and El Reno convene the Emergency Water Summit to educate citizens about the need to conserve water (*The Daily Oklahoman*)
- ☒ Feed the Children organizes a prayer schedule for Oklahomans to unite in prayer for rain (*The Daily Oklahoman*)
- ☒ fire crews have trouble getting equipment to the fires due to traffic jams caused by concerned citizens (*The Dallas Morning News*)
- ☒ U.S. Forest Service adds 120 firefighters to the wildfire force in Broken Bow, including a Hot Shot crew from Pleasant Valley, Arizona (*Tulsa World*)
- ☒ Broken Bow reports 7,800 acres of timberland destroyed by the two wild fires that began on July 29th
- ☒ Gov. Keating announces creation of a World Wide Web site with Oklahoma drought information
- ☒ Keating declares a state of emergency and activates the National Guard to deliver hay to ranchers

- ☒ officials evacuate campers at Beaver Bend Resort in Broken Bow as six fires burned the area (*The Daily Oklahoman*)
- ☒ July 1998 broke and doubled the previous record of 5,000 acres for acres burned during July (*The Sunday Oklahoman*)

August 1, 1998

- ☒ farmers cut soybean crop early to use as cattle feed (*The Daily Oklahoman*)
- ☒ park officials evacuated campers at Beavers Bend State Park (Ouachita National Forest) when six wildfires blazed through the dry timberland *the Norman Oklahoman*)
- ☒ Oklahoma Forestry Association offers a $50,000 reward for information leading to the arrest and convictions of the arsonist(s) suspected of setting the fires (*The Norman Transcript*)
- ☒ officials report 12 to 15 new fires in and around the Ouachita National Forest (*The Daily Oklahoman*)
- ☒ the fire response included three Oklahoma National Guard helicopters, American Indian and U.S. federal fire crews, the Oklahoma Wildlife Conservation Department, Oklahoma Highway Patrol, state fire marshal's office, the Idabel police and firefighters from Arkansas, Mississippi, Nevada, California, Colorado, Minnesota and the Cherokee, Chickasaw, Creek, Comanche and Kiowa nations (*The Daily Oklahoman*)

August 2-8, 1998

- ☒ Drought and Wildfire Awareness Week

August 2, 1998

- ☒ Altus Lake falls 13 feet exposing foundations from the town of Lugart, submerged years before to form the lake (*The Sunday Oklahoman*)
- ☒ the Beavers Bend fire result in the destruction of approximately 5,800 acres of timberland (*The Norman Transcript*)
- ☒ Chickasaw Nation trucks complete 48-hour round-trip to Illinois and back to Oklahoma to deliver hay (*The Sunday Oklahoman*)
- ☒ local Farm Service agencies begin distributing the donated hay to drought-affected farmers and ranchers (*The Norman Transcript*)
- ☒ temperatures top 100 degrees for the 16th day in a row, the third longest heat wave in the state's history (*The Norman Transcript*)
- ☒ Duncan Golf and Country Club fined $1,000 for illegally filling its ponds from an unmetered fire hydrant
- ☒ officials allow tourists evacuated from Beavers Bend Resort (Ouachita National Forest) to return
- ☒ the Beavers Bend fires destroy 3,800 to 5,800 acres and one home but cause no injuries

August 3, 1998

- ☒ Gov. Keating declares the week "Oklahoma Drought and Wildfire Awareness Week"
- ☒ the Oklahoma Drought Management Team estimates wildfires have caused more than $500,000 in damages
- ☒ the second National Guard caravan delivers hay to Durant and Atoka
- ☒ applications open for $3.4 million in federal aid to assist Oklahomans in homes with no air conditioning; the government set a maximum aid package of $150 per household; Oklahoma County receives more than 3,000 applications before the close of the business day; Tulsa County receives an equal number of applications; Comanche County receives 2,000 applications

August 5, 1998

- ☒ the Oklahoma National Guard triples its efforts, putting 100 troops on active duty and 50 trucks on the road (*The Norman Transcript*)
- ☒ Oklahoma experiences the first break in its heat wave - for the first time in 49 days no Oklahoma city reports a temperature of 100 or more (*The Daily Oklahoman*)
- ☒ Oklahoma City lifts its mandatory odd-even water rationing; it is the only city to do so (*The Daily Oklahoman*)
- ☒ Norman reports it has issued 100 tickets to water rationing violators since June 27 (*The Daily Oklahoman*)
- ☒ Yukon reports it has issued 78 tickets to water rationing violators (*The Daily Oklahoman*)
- ☒ El Reno reports it has issued 11 tickets to water rationing violators (*The Daily Oklahoman*)

August 7, 1998

- ☒ the Plains States Rural Crisis Summit convenes with agricultural representatives from 16 states; the summit results in 22 recommendations to Congress (*TheDaily Oklahoman, August 8*)
  the Forest Service reports 54 fires destroyed more than 10,000 acres since July 29 (*The Sunday Oklahoman*)
- ☒ Mustang lifts its outdoor water ban to allow odd-even watering (*TheDaily Oklahoman*)
- ☒ Newcastle allows hand watering of lawns (*TheDaily Oklahoman*)
- ☒ Nichols Hills limits outdoor watering to 10 p.m. to 7 a.m. (*TheDaily Oklahoman*)
- ☒ Norman enacts mandatory odd-even water rationing (*TheDaily Oklahoman*)
- ☒ Tecumseh enacts outdoor lawn watering ban (*TheDaily Oklahoman*)
- ☒ Union bans outdoor watering (*TheDaily Oklahoman*)

August 9, 1998

- ☒ as fires continue to burn in Ouachita National Forest, the public school in Broken Bow becomes Incident Command Post

- ☒ the Red Cross provides bottled water and sack lunches for the 284 firefighters from 18 states and five Native American nations
- ☒ more than 40 personnel county, state and federal law enforcement agencies investigate the fires

August 10, 1998

- ☒ a group of state senators take a helicopter tour of the forest lands destroyed by 61 fires since July 29

August 11, 1998

- ☒ National Farmers Union launches campaign to have federal loan rate caps removed (*National Farmers Union News*)
- ☒ the Federal Bureau of Investigations, and the federal Bureau of Alcohol, Tobacco and Firearms join the fire marshal's office in investigating the fire that destroyed Bethel Camp Israel Folsom, a church near Bethel, OK (*TheDaily Oklahoman*)

August 12, 1998

- ☒ President Clinton signed legislation that makes available $5.5 billion of aid to farmers (*Tulsa World*)
- ☒ the drought underscores the lack of water distribution systems in rural Oklahoma - in Daisy it becomes common for more than ten families to share one water well

August 13, 1998

- ☒ Gov. Frank Keating signs rules to implement a program to help farmers and ranchers build or rehabilitate ponds (*The Norman Transcript*)
- ☒ USDA releases Oklahoma crop forecasts for 1998 harvests:
  - ☒ cotton production falls 40 percent from 1997, the lowest production since 1895
  - ☒ grain sorghum production falls 29 percent from 1997
  - ☒ peanut production falls 11 percent from 1997
  - ☒ all hay production falls 27 percent from 1997 (*TheDaily Oklahoman*)

August 15, 1998

- ☒ President Clinton releases an additional $50 million in emergency aid funds to drought affected states; Oklahoma receives $2.3 million of the new funds (*The Norman Transcript*)

August 17, 1998

- ☒ local conservation offices begin accepting applications for the pond building program (*The Norman Transcript*, August 13)

August 19, 1999

- ☒ U.S. Department of Agriculture launches Hay Net, a national clearinghouse

to match farmers and ranchers with hay with those in need of hay using the existing staff, offices, and computers of the USDA's Farm Service Agency
Oklahoma's Operation Haymaker adds private truckers to National Guard deployment for hay delivery

August 20, 1998

☒ Gov. Frank Keating asks private-sector truckers and truck lines to help the National Guard move hay; interested truckers should contact OCEM (*The Norman Transcript*)

☒ Operation Haymaker releases a September 11 deadline for producers who want their hay delivered under the program (*The Norman Transcript*)

August 22, 1998

☒ Central Oklahoma Vo-Tech instructors join the Operation Haymaker transportation team (*Tulsa World*)

☒ OCEM announces that a program to pay private truck operators will not be ready until August 24, 1999 (*Tulsa World*)

☒ U.S. Department of Agriculture establishes Hay Net through Farm Service Agency (*Tulsa World*)

August 27, 1998

☒ state officials temporarily suspend cloud seeding activities in the northwest and Panhandle regions of Oklahoma (State of Oklahoma Water Resources Board)

August 30, 1998

☒ the state average wheat price falls to $2.14 per bushel, the first time the price fell below $2.20 since 1986 (*The Sunday Oklahoman*)

September 1, 1998

☒ the temperature hits or exceeds 100* F in more than 25 cities and towns in Oklahoma

September 2, 1998

☒ Gov. Keating modifies the mandatory burn ban in 44 Oklahoma counties to allow local fire officials to authorize controlled field/pasture burning to prepare fields for planting (Office of the Governor)

September 3, 1998

☒ state Medical Examiner's office reports 21 drought/heat wave related deaths in 1998 (*The Oklahoma Daily*)

September 8, 1998

☒ in some parts of the state wheat prices drop below $2 per bushel (*The Daily Oklahoman*)

September 13, 1998

☒ the state Department of Agriculture estimates that drought and falling prices will drive 25 percent to 30 percent of Oklahoma farmers and ranchers out business this year (*The Norman Transcript*)

September 15, 1998

☒ minor flooding occurs on the Neosho River near Commerce

☒ moderate flooding of farms and pastures from the Kansas border to the headwaters of Grand Lake predicted by the next morning

September 16, 1998

☒ National Weather Service issues flash flood warnings for Choctaw, Pushmataha, Le Flore and McCurtain counties (*The Daily Oklahoman*)

☒ state Forestry officials recommend that Gov. Keating remove 28 eastern counties from the mandatory burn ban (*The Daily Oklahoman*)

☒ fire danger remains high in western Oklahoma which did not receive rain (*The Daily Oklahoman*)

☒ state forestry officials report that the Broken Bow area suffered 735 fires that burned more than 21,000 acres in 1998 (*The Daily Oklahoman*)

☒ Oklahoma National Guard concludes its role in hay delivery after hauling 26, 696 bales since July 31

☒ Gov. Keating removes 28 eastern counties form the mandatory bun ban; 36 counties remain under the ban

September 23, 1998

☒ Governor Frank Keating lifts the burn ban in 13 counties

October 1, 1998

☒ Oklahoma Climatological Survey reports southwest Oklahoma is more than 13 inches below the average since April; the region remains in extreme drought (*The Norman Transcript*, October 3)

October 2, 1998

☒ between one and four inches of rain fell in western Oklahoma (*The Norman Transcript*, October 3)

October 3, 1998

☒ farmers say the rain will allow them to begin sowing winter wheat (*The Norman Transcript*)

October 5, 1998

☒ Governor Frank Keating lifts the burn ban in 21 counties; only Jackson and Kiowa counties remain under the ban

October 1998

☒ Congress approves a $6 billion drought aid package

November 17, 1998

☒ US Secretary of Agriculture declared 14 Oklahoma counties and three contiguous counties disaster areas at the request of Cherokee Nation Chief Joe Byrd

NAME [redacted]

DATE JANUARY 26, 2001

NAME AND ADDRESS	DATE