

Crystal J. Bergman; NDMC, School of Natural Resources, University of Nebraska-Lincoln crystal.bergman@huskers.unl.edu
 Stuart A. Foster; Department of Geography & Geology, Western Kentucky University stuart.foster@wku.edu

Abstract

Drought is a well-known and costly climate-related natural hazard. Unlike other climate-related natural hazards, droughts are usually long in duration and may cover a large region, the physical boundaries of areas affected by drought are sometimes vague, and the impacts are often difficult to identify. Climate records since 1895 show that drought has occurred periodically in Kentucky. The drought of 2007 was the most recent drought to affect Kentucky. The purpose of this research is to identify impacts of drought and potential vulnerabilities to various drought impact sectors in Kentucky so that policymakers can develop a drought plan that addresses these vulnerabilities and emphasizes mitigation efforts.

Impacts caused by the drought of 2007 were identified mostly through news reports. A sample of news articles was collected from Kentucky newspapers from 30 May – 30 September 2007. News articles were archived and documented in a spreadsheet according to the title of the news article, the origin of the news article, the date of publication, the location or region of interest, the impacts that were reported, the types of impacts that occurred, and key words. Using the National Drought Mitigation Center's impact classification system, each reported impact was classified as an economic impact, an environmental impact, or a social impact. An analysis of the frequency of reported impacts determined the drought impacts that would be further analyzed in the study.

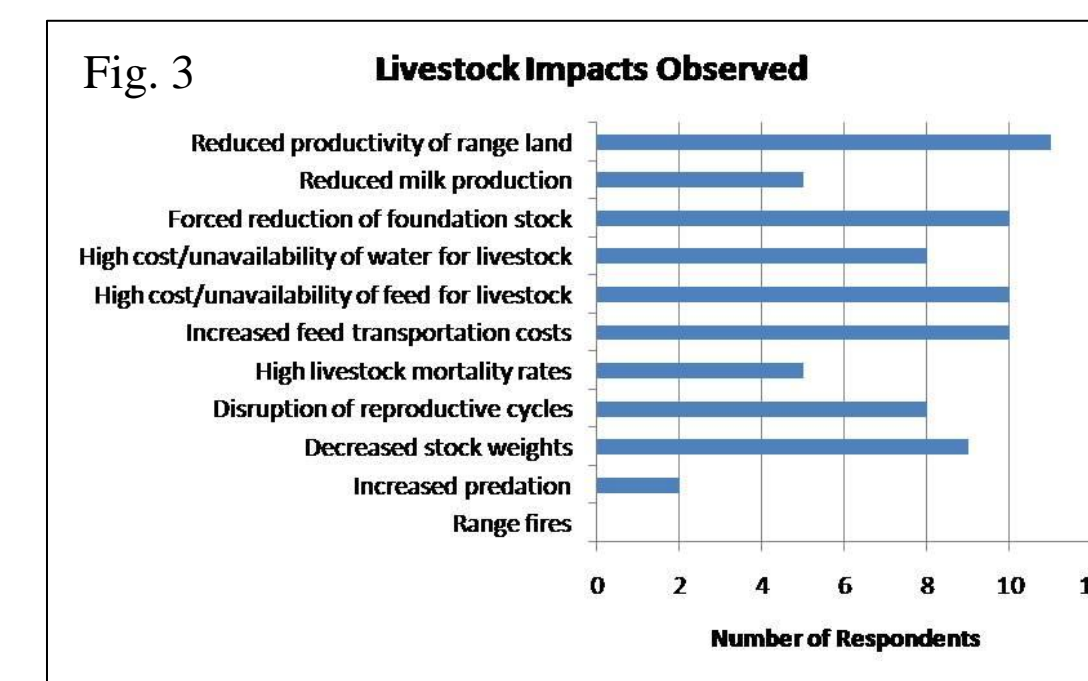
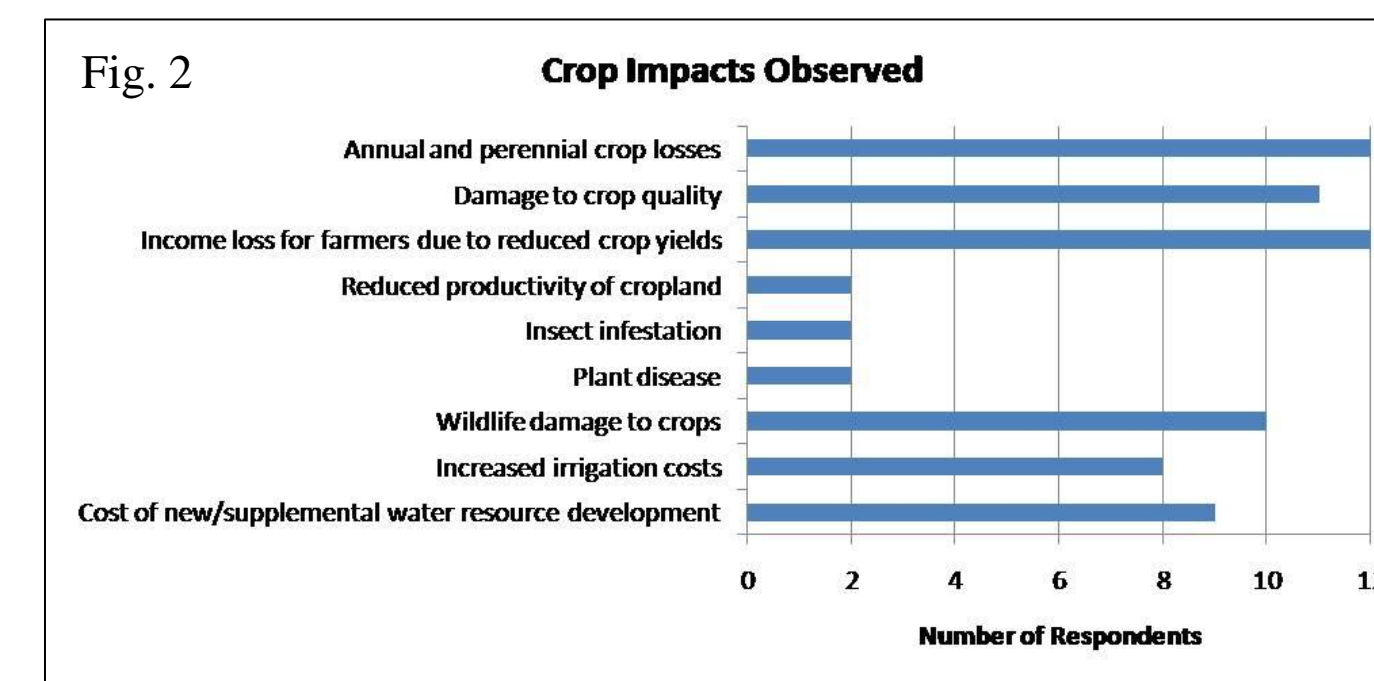
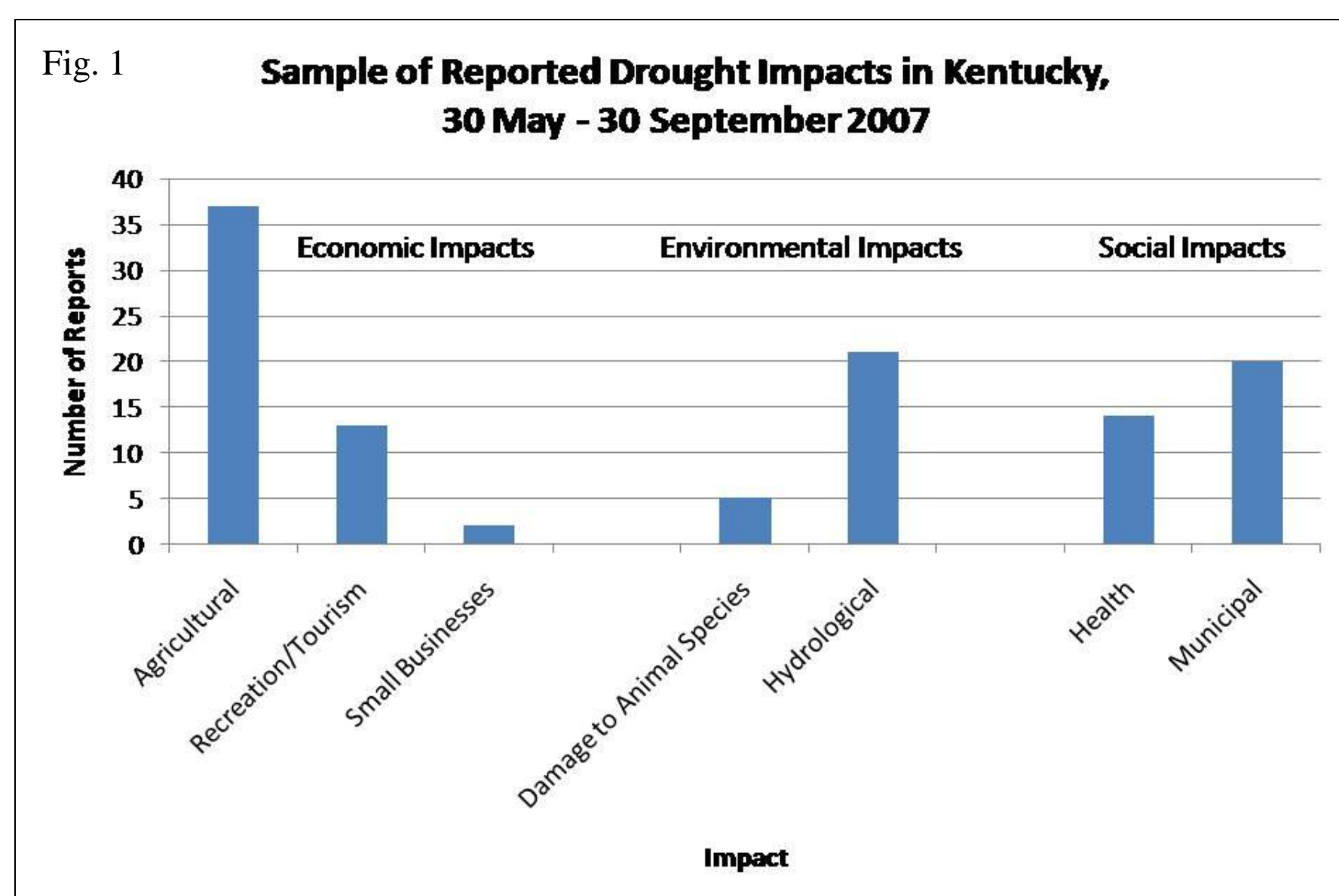
It was found that the drought of 2007 impacted agriculture, water supplies, recreation and tourism, the occurrence of wildland fires, plant and animal species, and small businesses. Impacts on agriculture were most frequently documented, but the other aforementioned impacts were not well documented. The documentation of drought impacts that occur in Kentucky should be improved. It is recommended that drought impact studies are implemented to determine how each of the above impact areas is vulnerable to drought. Policymakers can then use this information to determine the best practices that would reduce Kentucky's vulnerability to drought.

Drought impacts were identified through a sample of articles from various newspapers published in Kentucky. It is important to note that some news articles discussed more than one drought impact, so there were more impacts reported than news articles collected. Some impacts were difficult to classify into only one type of impact because they could easily fall into more than one classification. The three major economic impacts reported were impacts

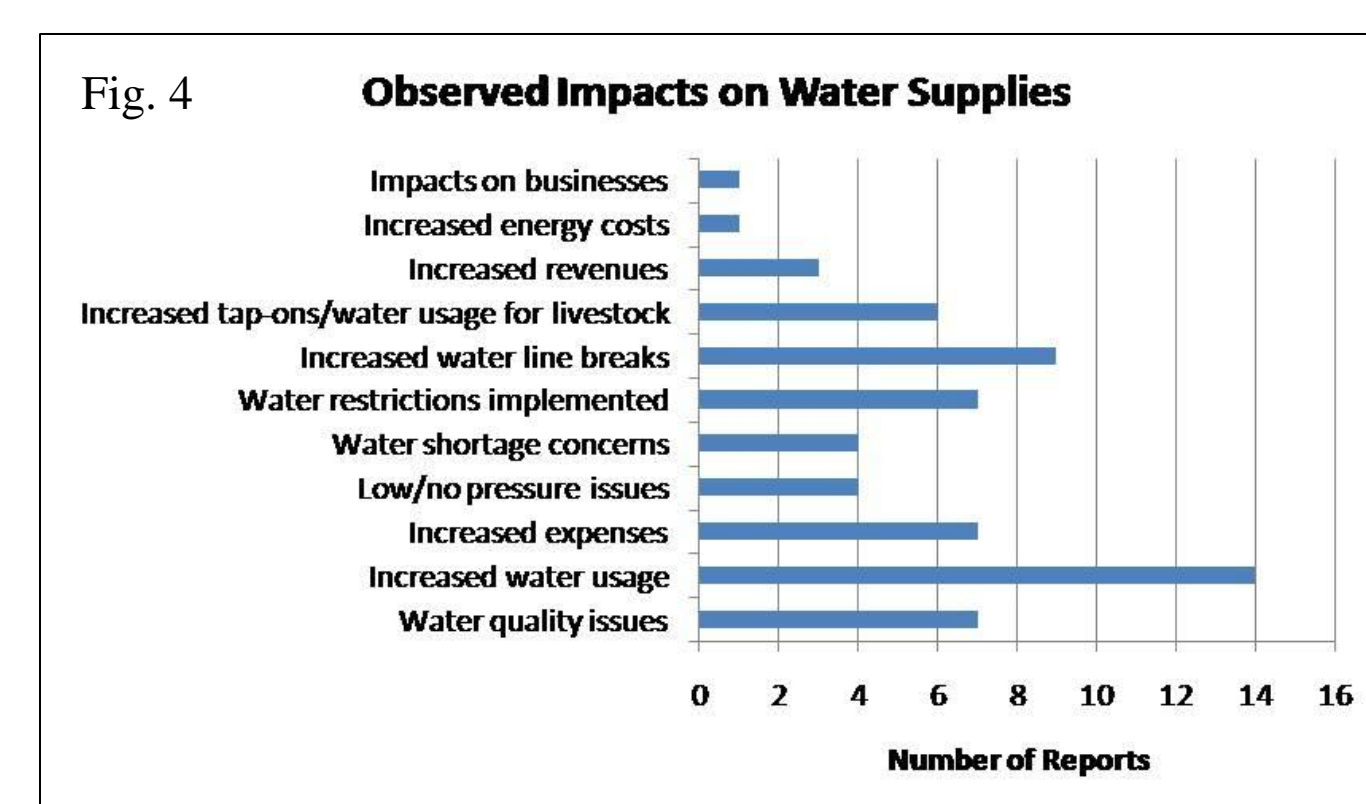
on agriculture, recreation and tourism, and small businesses (Fig.1). News reports that discussed drought impacts on livestock were included in the agricultural impacts. Hydrological impacts and damage to animal species make up the environmental impacts reported by media. The social impacts reported were impacts on health and municipal companies. The impacts on health were mostly because of increased fire potential that led to burn bans, and water main breaks or low-quality water that led to boil water advisories. Discussions on low-flow conditions or a shortage of rainfall were classified under environmental impacts, while discussions on water conservation or water restrictions were classified under social impacts.



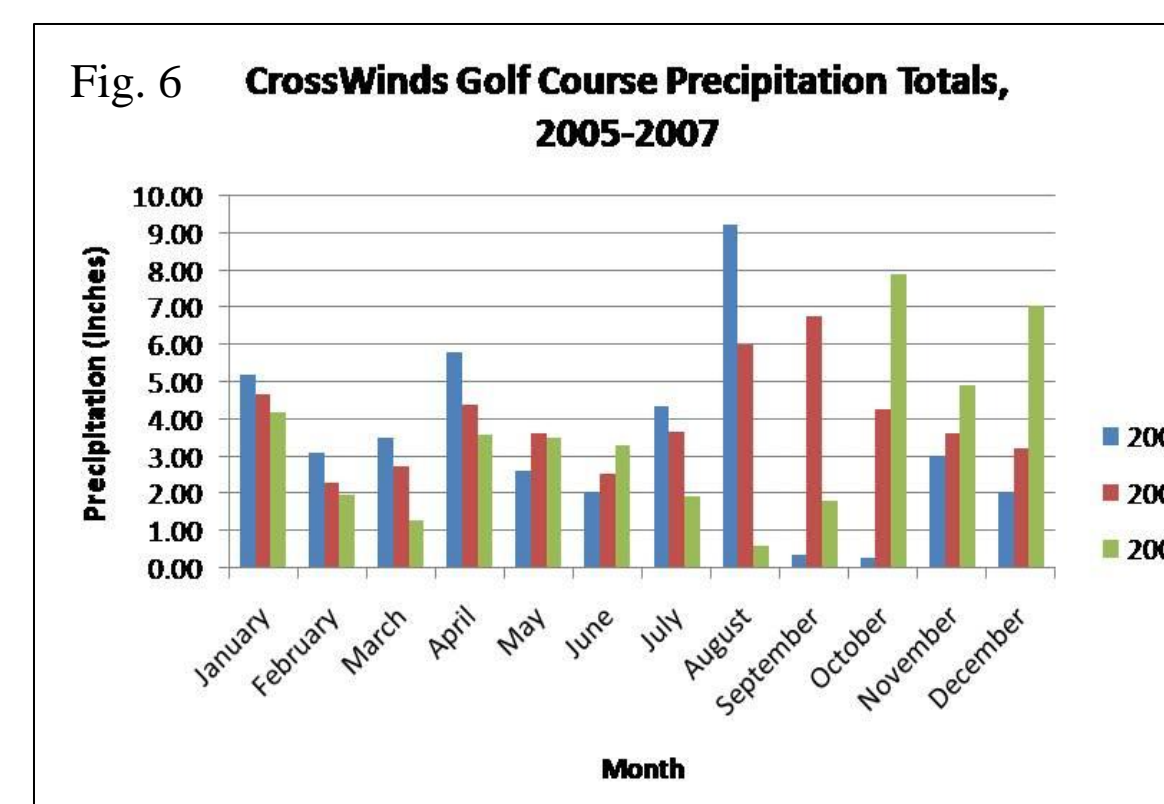
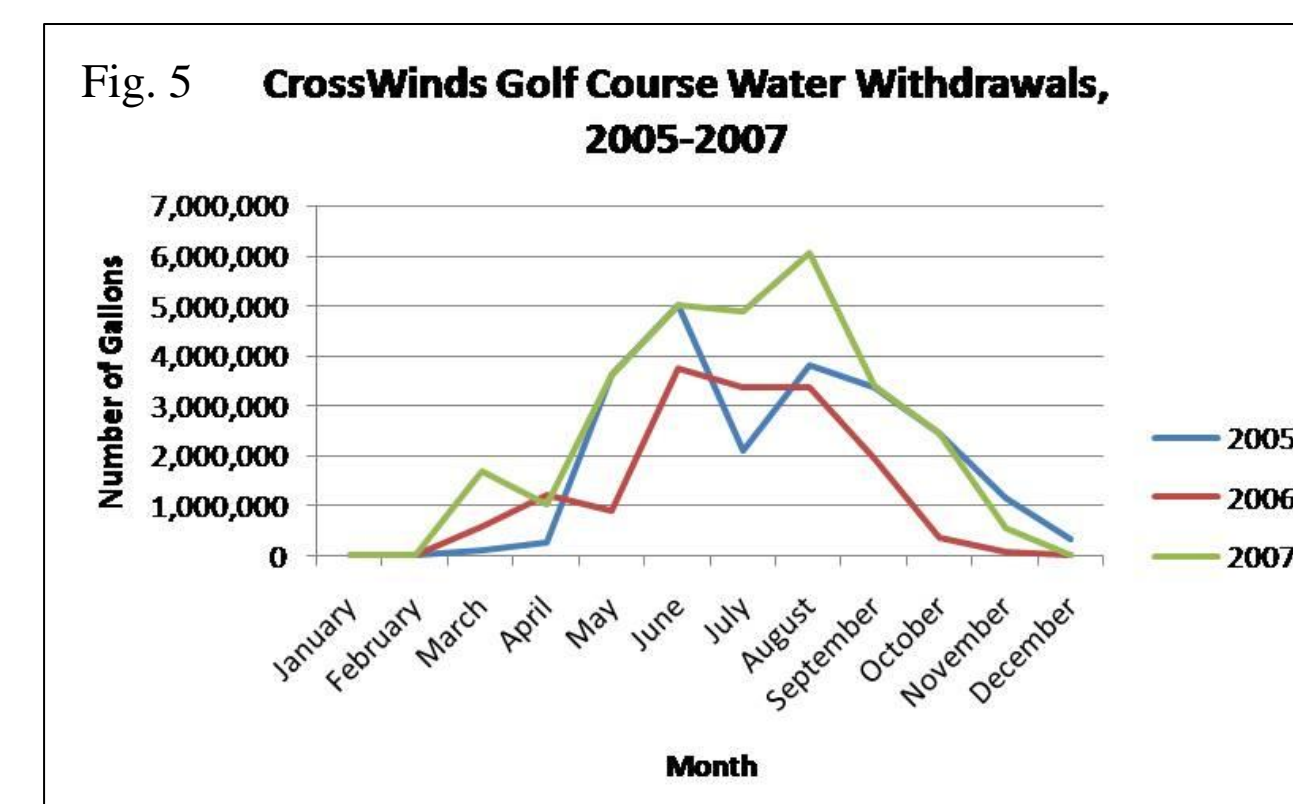
Cows grazing along a small patch of green grass (left) near a drying pond along 31-W in Bowling Green, Kentucky
 Photo taken by Megan Ferris, 2007



Surveys were distributed to Cooperative Extension agents in Kentucky to determine the greatest impacts the drought of 2007 had on agriculture. The above graphs show the frequency of reports of each of the listed impacts on crops (Fig. 2) and livestock (Fig. 3). Frequently reported crop impacts include annual and perennial crop losses, income loss for farmers due to reduced crop yields, and damage to crop quality. Reduced productivity of range land, forced reduction of foundation stock, high cost/unavailability of feed for livestock, and increased feed transportation costs were the impacts on livestock that were most frequently reported.

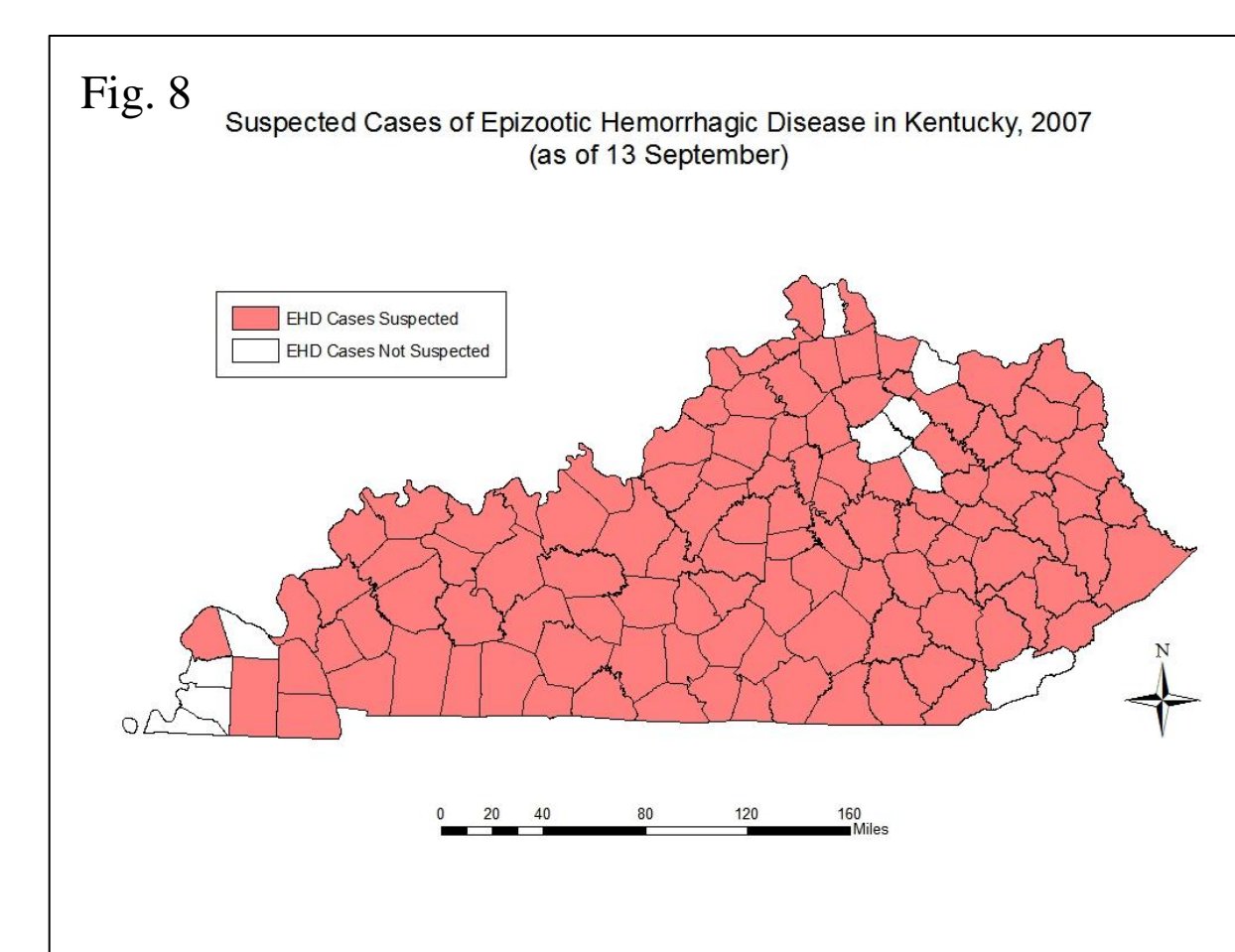
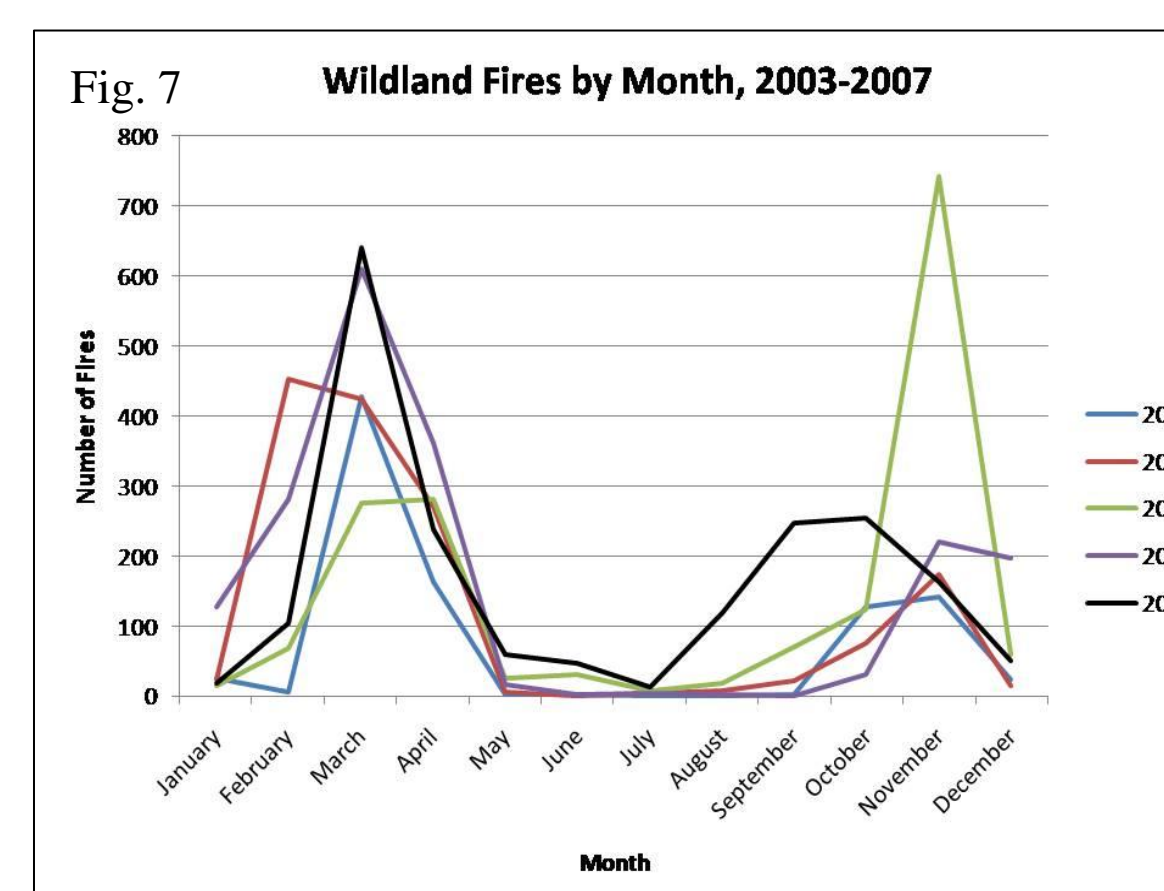


Surveys were also distributed to a sample of Kentucky's water suppliers to collect data on the impacts of the drought of 2007 on water supplies. Figure 4 reflects the impacts reported by survey respondents. Increased water usage and increased water line breaks were the most frequently reported impacts. It is interesting to note that three respondents reported increased revenues, which is a positive impact of drought.



CrossWinds is a golf course in Bowling Green, Kentucky, that was negatively impacted by the drought of 2007. CrossWinds draws water from the Barren River to water the fairways. The above graphs show the amount of water withdrawn for watering the fairways (Fig. 5) and precipitation recorded at the golf course (Fig. 6) for 2005, 2006, and 2007 (Whitmer 2008). Water withdrawals were highest in 2007 during July and August compared to the previous years, which corresponds well with lower precipitation amounts recorded during those months. Note that less than one inch of precipitation fell during August 2007. Higher withdrawals of water during the drought meant the golf course had to spend extra money watering the fairways to keep the course aesthetically pleasing to the eye and to continue attracting customers.

Kentucky's spring forest fire hazard season is February 15 – April 30 and the fall forest fire hazard season is October 1 – December 15 (KYDOF 2008). Figure 7 compares wildland fires by month in Kentucky for the years 2003-2007. At first glance, it is evident that the most fires occurred during the forest fire hazard seasons for each year displayed. It is interesting to note that in 2007 (the black line), the occurrence of wildland fires was considerably higher during August and September than any of the other years during those months. August and September 2007 were not typical months because a large number of fires occurred during these two months that did not occur during either of the forest fire hazard seasons. These two months experienced lower precipitation and higher temperatures on average compared to the previous four years.



It is believed that the drought of 2007 played a role in the outbreak of Epizootic Hemorrhagic Disease (EHD) among white-tailed deer. Although EHD occurs naturally in deer herds throughout the southeastern U.S., outbreaks are often associated with drought. The EHD outbreak in Kentucky in 2007 was the worst in at least 30 years. As of 13 September 2007, all but 10 counties in Kentucky reported suspected cases of EHD (Fig. 8). Dry conditions tend to cause deer to concentrate around water sources, increasing the chance of midges biting infected deer, then transmitting the disease to healthy deer nearby. The Kentucky Department of Fish and Wildlife Resources stated that the virus did not appear to be a threat to livestock, but several EHD cases were found in cattle in western Kentucky by the end of September 2007 (Lexington Herald-Leader 2007).



A stressed corn field (left) along 31-W traveling from Bowling Green toward Franklin, Kentucky
 Photo taken by Megan Ferris, 2007

Conclusions

The documentation of drought impacts that occur in Kentucky needs improvement. Currently, the best method of identifying impacts is through reports from news media. However, this is an unreliable method of acquiring information on impacts because reports can be biased toward a particular opinion or the topics may be skewed toward the interests of the general public. Agricultural impacts are documented better than any other impact because the National Agricultural Statistics Service and the Kentucky Department of Agriculture compile and report detailed data on agricultural commodities.

Impacts on water supplies are not as well documented. There are official data that record precipitation, streamflows, lake levels, and groundwater levels across Kentucky, but they do not properly illustrate the spatial disconnect between a drought's location and its resulting impacts. The region experiencing the greatest water shortage issues is often not the one that has received the least amount of rainfall. For example, a community that gets its water from a stream relies on rainfall upstream to recharge its water supply. If rain is not falling upstream to replenish the community's water supply, the community can be greatly impacted by drought occurring upstream. Also, water systems are intricately interconnected and it is extremely difficult to accurately identify which water systems will endure the greatest impact from a drought. These issues provide an explanation for why an analysis of water supplies' vulnerability to drought is a very necessary component of Kentucky's drought plan.

Drought impacts on recreation and tourism, the occurrence of wildland fires, plant and animal species, and small businesses are not documented well at all. The majority of agencies involved in these sectors that were consulted for this study stated that they had never conducted drought impact studies. Officials involved with the recreation and tourism industry in Kentucky seemed least concerned about the effects of drought because impacts were not immediately evident. Officials involved in the other sectors were more concerned about the impacts of drought, even if they had little evidence that drought had greatly impacted them. Drought impact studies would be very useful to each of these sectors to determine their vulnerability to drought. If officials involved in these sectors find out they are vulnerable, then they can begin preparing for how to best protect their sectors from drought.

References

- KYDOF [Kentucky Division of Forestry]. Kentucky Wildland Fire Situation Report. Last modified 10 December 2008. Available from <http://www.forestry.ky.gov/situationreport/>. Accessed 10 December 2008.
- Lexington Herald-Leader. 2007. *Deer Virus Killing Cattle*. Lexington, KY. Published 27 September 2007.
- Whitmer, Tony. 2008. Golf Course Superintendent, City of Bowling Green Golf Division. Personal correspondence.