SETTING THE DROUGHT AGENDA: A COMPARATIVE STUDY OF LOCAL AND NATIONAL NEWSPAPER COVERAGE OF THE CALIFORNIA DROUGHT, 2013-2015

By

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ABSTRACT

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This study applies public agenda-setting theory to test the influence of newspaper coverage on Los Angeles resident concern for drought. Using a content analysis method, this study samples two local and two national newspapers, examining drought news during the height of California drought conditions, 2013-2015, and comparing coverage with measures for public opinion and natural climatological conditions. The study finds that local newspapers help set the public agenda by raising concern for drought, while natural conditions do not. The study also finds that local and national coverage of drought differed, such that national newspapers emphasized issues of morality, conflict, and development more than local news. Analysis of California drought coverage, though limited, elucidates the ways newspaper media confine the slow-onset hazard to episodic news cycles, and elaborates an understanding of the effect of geographic proximity, a necessary step in advancing risk-based communication approaches for climate-based hazards.

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KEY TO ABBREVIATIONS

LAT ..... Los Angeles Times

LDN ..... Los Angeles Daily News

NYT ..... The New York Times

PDSI ..... Palmer Drought Severity Index

PPIC ..... Public Policy Institute of California

WSJ ..... The Wall Street Journal

CHAPTER I: INTRODUCTION

Newspaper reporting constitutes an important and trusted source of public knowledge concerning natural hazards, and recent scholarship (e.g., Carr et al., 2016; Feldman et al., 2016; Steelman & McCaffrey, 2013) has investigated the best practices for risk and crisis communication in the media. Hazard-based reporting, akin to other general science reporting, conforms to media routines (Houston, Pfefferbaum, & Rosenholtz, 2012; Trumbo, 1996). Natural hazards are frequently confined within episodic- or event-oriented news cycles. They are reported as discrete events, propagated by physical, social, political, and economic issues concerning crises and consequences. While event-centric newspaper reporting may suit typical natural hazard episodes (e.g., floods, earthquakes, and hurricanes), newspapers are less adept at reporting on slow-onset or crescive hazards such as drought, coastal erosion, or even climate change. Scientific discussion on slow-onset hazards focuses on drought (Twigg, 2004), which collectively affects more people worldwide than any other natural hazard (Wilhite, 2000). Drought is also the costliest global hazard (Witt, 1997), having contributed an annual average of $7.2 billion in damages to the United States alone between 2000 and 2014 (NCEI, 2016). A creeping threat, drought is both temporally and spatially distributed. The hazard develops over months or years until reaching full cumulative impact, often resulting in severe water and crop shortages. As a result, the approaches to mitigating drought impacts and vulnerability differ for those against sudden- or rapid-onset hazards. Like drought risk management, media reporting about drought must cover a spectrum of response strategies and frames that not only correlate with spatial or temporal effects, but also address the gradations of the experienced drought. Without identifying and reporting new meanings of drought using social and climatic contexts, newspapers (and other media) cannot effectively reframe drought to engage an at-risk audience.

Unfortunately, such a diverse spectrum of frames is not commonly associated with traditional news reporting (Nisbet, 2009).

Study focus and significance

Because most studies in this area (e.g., Rowe, Frewer, & Sjoberg, 2000; Wrathall, 2007) tend to focus on newspaper representations of rapid-onset, event-oriented hazards, this study instead focuses on how newspapers cover drought through space and over time. Little research (e.g., Chyi & McCombs, 2004; DeLung, Magee, DeLauder, & Maiorescu, 2012; Donnelly, 2005) has elucidated how geographic proximity to an event affects news frames, and no research has examined the effect of proximity on natural hazard newspaper frames. Therefore, I focus on the frames used to report drought in local and national newspaper media, filling a gap in communication literature about natural hazards.

Using a quantitative content analysis of drought coverage, a survey that identifies public concerns about drought, and actual drought conditions (i.e., Palmer Drought Severity Index), this study investigates the public agenda-setting influence of two levels (i.e., local and national) of newspaper media on public concern over drought. It analyzes the way newspapers cover California's current and enduring drought. The study also reaffirms the value of the engagement-based frame typology presented in Nisbet (2009), and it adapts the typology to fit the idiosyncrasies of drought coverage. In addition to advancing both agenda-setting and framing theory, this study builds awareness about the current state of U.S. drought newspaper coverage and where improvement is warranted. Most importantly, it reveals whether media's proximity to drought and the framing of its messages has an influence on public concern.

To understand the relationship between media representations, natural conditions, and public opinion the following chapters will discuss the context and research design of this study.

Chapter two presents the context for drought, including what a drought is, how it is classified and measured by physical scientists, as well as background information on the current drought in California. Chapter three focuses on the body of literature that informed the development of this study. This scholarship includes how U.S. media frame general and environmental news, how local and national issue-coverage differs, how media cover natural hazards like drought, and how media attention and public opinion are impacted by climatic change. Chapter four compares agenda-setting and framing theory, the theoretical frameworks used in this study (McCombs & Ghanem, 2001; McCombs & Shaw, 1972). Chapter five presents a series of research questions, and chapter six discusses the content analysis research method, including methods for the data collection, sampling procedure, coding, reliability testing, and data analysis. Chapter seven examines the results through correlation and chi-square statistics. Finally, chapter eight presents the conclusion, including local-national media comparisons, a discussion of the results, practical implications, and limitations for future research.

CHAPTER II: BACKGROUND

Drought is commonly defined as an abnormal and prolonged deficit in rainfall that can affect multiple systems (Mishra & Singh, 2010). It is a spatially and temporally diffuse hazard with environmental, economic, and social impacts (Wilhite, Hayes, Knutson, & Smith, 2000; Wilhite, Svoboda, & Hayes, 2007). Drought can degrade fish and wildlife habitat, increase the risk of wildfires, reduce soil quality, force farmers to fallow fields, encourage water infrastructure development, reduce hydropower capacity, escalate public health risks and concern, constrain public water supplies, and provoke mandated water rationing (Wilhite & Vanyarkho, 2000). Drought is a pervasive hazard occurring in virtually all countries and climate regions (Wilhite, Sivakumar, & Pulwarty, 2014). Despite attempts to quantify the severity of water deficiencies (e.g., Keyantash & Dracup, 2002), drought cannot be defined purely as a physical phenomenon. Instead, drought embodies a unique interplay between natural climatological conditions and human-induced stresses to natural and human-made water systems. Drought thus includes a social dimension, demand for water, that can exacerbate its environmental and economic impacts, as well as endanger personal wellbeing.

Drought is often considered a slow-onset hazard because its impacts are experienced on the order of months or years, unlike natural hazard events such as floods. The prolonged process of drought means its effects accumulate over time, often creeping up slowly without warning. For example, it may take up to two years of deficient precipitation before "water demand areas such as urban water supplies are drought-affected" (Changnon & Easterling, 1989, p. 27). Drought definitions are thus mediated by physical, cultural, and historical contexts and locations (Llasat, Llasat-Botija, Barnolas, Lopez, & Altava-Ortiz, 2009; Mishra & Singh, 2010; Wilhite & Glantz, 1985). They are necessary for hazard identification, specifically drought onset and

termination, and risk management. Unfortunately, differences in "hydrometeorological variables and socioeconomic factors" as well as the changing nature of water demands in different regions inhibit the creation of precise definitions of drought (Mishra & Singh, 2010, p. 205).

The presence of drought is commonly assessed using precipitation, diminished soil-water availability, decreased reservoir levels, or reduced streamflow (Changnon & Easterling, 1989). These measurements represent physical impacts that can affect multiple systems and, ultimately, the people within them. For example, impacts to people can include water service cancelations, limits on water use per capita, and others. Conventional scholarship identifies these impacted systems, operationally defining the four main types of drought: meteorological, agricultural, hydrological, and socioeconomic (Wilhite & Glantz, 1985).

Drought classification

Each of the four conventional drought classifications is experienced in sequence (NDMC, 2015). Meteorological drought is experienced first. It is defined by precipitation deficiencies and measured against the average amount and intensity of rainfall events over time. Because the degree of dryness and duration of meteorological drought are compared against normal atmospheric conditions, measurements of meteorological drought should be specific to the region that is experiencing drought (Keyantash & Dracup, 2002; NDMC, 2015). Agricultural drought is experienced second and builds on meteorological drought conditions. It considers drought characteristics that impact agriculture, specifically cultivated crop success, including precipitation shortages, evapotranspiration, and related soil-water deficits (Wilhite & Glantz, 1985). The third physical drought classification, hydrological drought, is experienced next, and compares the effects of precipitation deficiencies on surface and groundwater supply (i.e., streamflow, reservoir and lake levels, and groundwater storage; NDMC, 2015). Hydrological

drought concerns how precipitation deficits disturb the hydrologic system and is therefore measured at a watershed- or basin-level (Wilhite & Glantz, 1985). The fourth and final experienced drought type is socioeconomic. Socioeconomic drought will not occur in isolation from one of the three physical forms, unless "societal demand consistently exceeds natural [weather-related water] supply" (Keyantash & Dracup, 2002, p. 1168). Socioeconomic drought is frequently measured using negative economic impacts and is discussed in terms of the capability of a water supply system (e.g., infrastructure) to meet community demands (e.g., drinking water) amid physically- or socially-induced drought conditions (Mishra & Singh, 2010). Socioeconomic drought is often what turns the natural hazard into a natural disaster, the product of the hazard and human vulnerability to it (Twigg, 2004). Each successive drought type is "out of phase" with meteorological drought (NDMC, 2015). Just as it takes time for rainfall shortages to affect soil-moisture, it takes time for the same deficiencies to influence the hydrological system and later impact local socioeconomic (and media) systems.

Drought indices

The severity or intensity of the three physical drought types (i.e., excluding socioeconomic drought) is computed and assessed through drought indices that independently define and measure precipitation type and quantity. These indices often account for precipitation anomalies across different timescales and are calibrated for specific climatic regions (NDMC, 2015). The standard, operationalized drought indices assimilate large quantities of water supply data into one number used for decision-making (i.e., water planning). No drought index is best. Each drought index relies on different drought classifications, definitions, and climatic contexts, as well as measures for severity. For example, the widely used Palmer Drought Severity Index (PDSI) was developed by the U.S. Department of Agriculture to measure the degree of

meteorological drought conditions and to determine when to grant drought assistance (NDMC, 2015). The PDSI is represented as a dimensionless number that ranges between 10 and -10, with "negative quantities indicating a shortage of water" (Keyantash & Dracup, 2002, p. 1171). The PDSI is preferred for use in areas with relatively uniform topography and does not account for the lag associated with certain precipitation types (i.e., snow) entering natural systems. The Surface Water Supply Index (SWSI), however explicitly considers snowpack and its delayed runoff (Keyantash & Dracup, 2002). The SWSI measures hydrological drought conditions, including precipitation, snowpack, streamflow and reservoir storage, based on the historical record, and it is more suited than the PDSI to assess drought in areas with complex regional microclimates. Unfortunately, the SWSI is not calculated for California.

Because each drought index quantifies different characteristics of drought, water planners frequently consult multiple indices before making drought management decisions (NDMC, 2015). Despite the number of available indices, however, most lack the transparency required for use by a drought-affected public. For this reason, news media regularly report drought using the percent of normal (Keyantash & Dracup, 2002), which is calculated by dividing the actual precipitation by the normal (i.e., 30 year mean) precipitation and multiplying by 100 percent (NDMC, 2015). While a simple and transparent measure, the percent of normal lacks extendibility because it is limited to measuring one region over one season, which makes it difficult to link wide precipitation deviances with specific drought impacts (Werick, Willeke, Guttman, Hosking, & Wallis, 1994).

California drought

California, the most populous American state, faces record rainfall deficits contributing to a half-decade of drought. Altered routes of atmospheric water vapor, and a subsequent lack of

precipitation caused drought conditions, which started in 2012 (CNAP, 2014). Storms that would have normally soaked California were pushed far north due to a high-pressure system in the northeastern Pacific Ocean nicknamed the "Ridiculously Resilient Ridge." Due to sustained severe drought conditions, California Governor Edmund G. Brown Jr. declared a State of Emergency on January 17, 2014 that called for the implementation of local water contingency plans; reductions in residential water consumption; acceleration in funding for water supply projects; and reductions to water diversions. Nearly 100 percent of California experienced severe historical drought in 2014 and thousands of crop acres laid fallow. In April 2015, Governor Brown mandated a first-ever 25% statewide water use reduction and announced additional actions to increase California's drought resilience. Despite predictions that 2015 would be a record El Niño year, associated precipitation increases did not sufficiently replenish reservoirs or alleviate rainfall deficits. One year later, 74% of California was still experiencing severe drought (NDMC, 2015).

This study investigates the recent, high profile case of drought, separating itself from the traditional focus of media analyses on quick-onset hazards and reinforcing the need for analyses of crescive climatological phenomena. Through consideration of agenda-setting and long-term environmental conditions, this study examines the influence of media and the environment on public opinion. The relevance of its findings extends beyond the issue of drought and drought reporting and encompasses the many environmental issues that have cumulative effects over time.

CHAPTER III: LITERATURE REVIEW

While research has frequently observed the way media report on hazards (e.g., Rowe, Frewer, & Sjoberg, 2000; Shih, Wijaya, & Brossard, 2008), fewer media analyses have addressed natural hazards (e.g., Spencer & Triche, 1994), especially at both the local and national level. Fewer still are the media analyses focusing on hazards that develop in slow-motion, like drought. The recent historic drought in California, intensified by an immense yet growing population and an agriculture industry to match, provides an opportunity to investigate how local and national media represent the drought an how newspaper coverage correlates with local public opinion and with climatic conditions between 2013 and 2015.

The influence of news media on public opinion has been well documented in agenda-setting scholarship (Iyengar & Simon, 1993; Liu, Vedlitz, & Alston, 2008; McCombs, 2004; Soroka, 2002). This influence is exercised dually in setting the public agenda. First, through frequent and repeated messaging, news media can affect the salience of an issue over time (Liu, Vedlitz, & Alston, 2008; McCombs & Shaw, 1972). Second, the news media have control over the way issues are presented and can therefore influence how the public think about the issues. For example, media representations affect perceived solutions to issues (Liu, Vedlitz, & Alston, 2008), such as drought mitigation.

This study adapts both tenants of public agenda-setting and applies them to the understudied issue of drought messaging. It investigates the temporal dimension of drought and its influence on newspaper coverage. This study also demonstrates the similarities and differences in local and national coverage of a geographically confined topic that has national implications. Most importantly, it explains how different newspaper media operate over the

course of a creeping hazard and introduces the potential mediating effect of natural conditions on public opinion.

U.S. news framing

The way U.S. media frame general and environmental issues is no doubt influenced by the socioeconomic and political elements of the communities specific media represent. Culture itself is the "stock of commonly invoked frames," and journalists consciously or subconsciously select some facet of culture to make their stories more salient to readers (Entman, 1993, p. 53). Framing embraces a variety of causal definitions, but primarily includes issue selection and salience. This process is not value-free. By highlighting some aspects of reality, framing increases the salience of certain issues while demoting others. As salience increases, so does the likelihood that an audience will identify, process, and commit an issue to memory (Entman, 1993). Of course, salience can also increase through message repetition and/or associations with common cultural symbols. Framing essentially helps create a mental map for journalists and audience members to connect individual stories with context (Griffin & Dunwoody, 1997). For example, a news frame that simply reinforces a reader's preexisting belief may be especially salient. However, just as one person's experience with the physical environment varies, so does the influence of news frames vary within a community (Griffin & Dunwoody, 1997).

Despite this variance, the influence of news frames on public opinion is well documented (Entman, 1993). The strength of this influence is not only dependent on the target community, but also on the type of frame used. No one news frame dominates across U.S. media, but previous research has revealed two fundamental news frame types that do appear across issues, time, and space (Iyengar, 1991). These broad frame types, episodic and thematic, influence attributions of responsibility, intensity of emotional reactions, and public opinion in television

news content (Iyengar, 1991). Content that uses episodic frames emphasize discrete events and human-interest details, which are more humanizing and emotional than thematic content, which focuses on impersonal context and analytics (Iyengar, 1991; Papacharissi & Oliveira, 2008).

Iyengar (1991) observed an influence of episodic television news content on public opinion, but he emphasized that the subject matter is as important as the choice of frames. In an experiment, Aaroe (2011) demonstrated that strong emotional frames in text generate strong framing effects on participants. Because episodic frames are used frequently in U.S. media, U.S. news content often triggers strong emotional reactions and therefore has the potential to influence public opinion (Aaroe, 2011). However, these assumptions have not yet been substantiated in content analyses of newspapers content.

Frames and sources

Frames are not only influenced by journalists and their news organizations, but they are also influenced by their use of sources (Crawley, 2007). Sources from social, political, and economic organizations often shape the news, encouraging viewpoints that can be associated with different frames (Gamson, 1988, as cited in Crawley, 2007). Like frames, sources compete for dominance. When a source has successfully framed news content, it has strategically defined issues in ways that minimize opposing viewpoints. The influence of sources changes depending on time constraints, budget, geographic proximity, and institutional pressures (Carpenter, 2007). This is why readily accessible sources, such as government officials or scientists tend to dominate hazard media (Houston, Pfefferbaum, & Rosenholtz, 2012).

Because this study is interested in the way media content is presented, as well as how the public is influenced by that content, it is important to address how proximity affects the local and national news landscape.

Local and national news coverage

News coverage is inescapably influenced by proximity. How near a media organization is to any newsworthy event affects the accessibility and cost of coverage. Location may also determine how news issues are communicated and framed (Carpenter, 2007). National newspapers, often regarded as elite publications, are commercial organizations that distribute news nationally, whereas local or non-elite newspapers focus on circulating content at the state- or community-level (Carpenter, 2007). Although both local and national news often consider reporting the same topics, particularly issues with cross-state significance, newspaper status and geography can act as resource barriers to news production routines, such as acquiring appropriate news sources. Such barriers can affect a news organization's ability to employ freelance or beat reporters, as well as influencing their ability to provide ample, accurate coverage.

Local newspapers tend to rely on traditional, straight news accounts (i.e., inverted pyramid), reporting facts in their limited context, while national newspapers are more broadly focused on interpretative frames that fit a national perspective or trend (PEJ, 2009). National newspapers regulate the news agenda of other publications (Carpenter, 2007) and construct "powerful images of nation" (Boyd-Barrett, 2000, p. 13). They are removed one level from local media and are more likely to present both sides of a community controversy (Lacy, Fico, & Simon, 1991), such as water rights. Local newspapers emphasize local- and state-based issues to distinguish themselves from more elite publications and to serve their immediate market, but they less frequently employ conflict frames in reporting (Carpenter, 2007). This is especially true

of local newspapers in homogenous communities that seek social cohesion (Evans & Riffe, 2015). Local newspapers also tend to allocate more space for national topics through wire content (Lacy & Bernstein, 1988), likely due to staff and resource limitations.

In the same way that the type of coverage varies depending on location, readership also varies across local and national news. Interest in local news is high, with 68 percent of residents in large cities and 73 percent in rural areas mentioning they follow local news closely (Miller, Rainie, Purcell, Mitchell, & Rosenstiel, 2012). In contrast, suburban residents follow national news more closely (74%) than other community types (67%). Overall, residents in large cities and adjacent suburbs tend to read more local sources each week than national sources (Miller et al., 2012).

Because the status and location of a newspaper can shape how an event, crisis, or issue is covered (Lacy, Fico, & Simon, 1991), it is important to identify case studies that analyze newspaper coverage and frames of this study's main topic and related creeping hazards, which each have local and national ramifications.

Natural hazard coverage and analysis

Effective drought monitoring and assessment requires an understanding of how hazard characteristics are reported in the media, including the hazard-specific impacts that extend beyond geography and penetrate different systems, sectors, and social groups. Therefore, to understand how newspapers frame drought and to inform risk communication, it is critical to evaluate how natural hazards are reported. In drought, for example, instances of mortality and injury are less common than in other natural hazards (Houston, Pfefferbaum, & Rosenholtz, 2012). Reports of mortality, while appropriate for rapid-onset hazards, are not accurate indicators of drought severity. Hazard characteristics and frames, including conflict and uncertainty,

influence the way news media report on specific hazards, their public salience, and the context through which mitigation strategies are developed (Rowe, Frewer, & Sjoberg, 2000).

As the severity of and vulnerability to natural hazards increase amid a changing climate (Houston, Pfefferbaum, & Rosenholtz, 2012; Wilhite & Vanyarkho, 2000), so must news coverage increase to meet public information demands. Pressures from population growth increase the number of people exposed to hazard risks (Wilhite & Vanyarkho, 2000), and reports of hazards should address that increase with more coverage. These reports, if constructed appropriately, should advise the public on potential future hazards, provide descriptions as hazards unfold, update hazard information post-event, and promote community recovery efforts (Houston, Pfefferbaum, & Rosenholtz, 2012). Unfortunately, the media covers natural hazards for shorter periods on average than for other newsworthy issues. Houston, Pfefferbaum, and Rosenholtz (2012), in their content analysis of national newspapers, observed that the average timespan of natural hazard coverage was 12 months, as opposed to the 18.5-month average for public issues measured in agenda-setting research. The limited 12-month coverage window means media largely focus on hazards as they occur. These stories tend to focus on impacts to the state or region (Houston, Pfefferbaum, & Rosenholtz, 2012), meaning national, societal, community, and individual impacts are less frequently reported. Of these reports, impacts to humans, particularly in business or government sectors, are most common (Houston, Pfefferbaum, & Rosenholtz, 2012). This is due, in part, to the fact that news media generally rely on official sources for hazard information (Houston, Pfefferbaum, & Rosenholtz, 2012; Lowrey, Gower, Evans, & Mackay, 2006). News media also cover impacts to the built and natural environment. But whether coverage attends to social, economic, or environmental effects, it still focuses on the "dramatic descriptive qualities of the events rather than on causal explanations"

(Ploughman, 1995, p. 319). Understanding how news represents hazards and their effects is relevant to crisis and risk communication, but it has not been a central component of media research on droughts until recently.

Drought coverage and analysis

Research on media coverage of sudden-onset natural hazards is more comprehensive than research on media representations of drought. Research on media coverage of drought is growing, but it largely focuses on the temporal pattern of drought and its impacts at the regional level (Changnon & Easterling, 1989; DeGaetano, 1999; Dow, 2010). Understanding the timing, amount of coverage, and reported issues or impacts is critical. It helps understand how drought is framed and, similarly, the salience of different drought characteristics.

Drought has a "direct social impact through mass media, whose analysis, typology, and characterization should be a priority in strategies to plan and mitigate effects" (Sinoga & Gross, 2013, p. 709). Despite this role of media to propagate hazard information to the public, studies have only recently begun to address how and when drought is reported in media. Drought impacts are delayed unlike other natural hazard impacts, which can complicate the precision of coverage. For example, accurate coverage of the current California drought, which spans half a decade, would certainly not fit the average 12-month window for natural hazard coverage. Similarly, drought impacts are linked with the type and sequence of drought, whether meteorological, agricultural, hydrological, or socioeconomic. Drought subtly emerges as a meteorological deficit and progresses over months and years into a physical source of socio-political conflict. Newspapers can help indicate the timing of droughts as they develop and penetrate further into society (Changnon & Easterling, 1989; Llasat et al., 2009; Sinoga & Gross, 2013).

Drought affects four major sectors, including the agricultural, public, commercial, and domestic sectors. The media attention given to each sector depends on the type of drought and the duration of their impacts. While drought manifests first in observed rainfall deficits, the difficulty in determining the onset of drought means newspaper reports of sustained precipitation shortages rarely recognize that a drought has actually initiated. Instead, agricultural drought and associated agricultural sector impacts are reported first in newspapers (Changnon & Easterling, 1989; Dow, 2010). Reported agricultural impacts focus on farm or crop production and livestock holdings. U.S. dependence on agricultural production and the relatively visible impact of drought on agriculture in drought-prone regions results in increased coverage of agricultural impacts. Agriculture comprises a majority of drought newspaper coverage and is sustained through both the growing and harvest seasons (Dow, 2010). Public sector impacts are reported after agricultural ones and focus largely on concerns related to municipal water systems and infrastructure, including how to manage water shortages and conservation efforts while experiencing reduced streamflow and reservoir levels (Changnon & Easterling, 1989; DeGaetano, 1999; Dow, 2010; Sonnett et al., 2006). In her analysis of drought impacts in the U.S. Carolinas, Dow (2010) revealed that agriculture, livestock and water supply constitute 40 percent of local newspaper coverage. Commercial impacts to businesses (e.g., restrictions on water-intensive industrial processes) and domestic impacts to homes (e.g., restrictions on lawn irrigation) appeared less frequently and later in drought coverage due in part to their focus on local issues experienced within a newspaper's circulation (Changnon & Easterling, 1989; DeGaetano, 1999; Dow, 2010). This order of newspaper coverage is consistent with the sequence of drought types, where emphasis on the natural event decreases and reporting on social

dimensions, including conflict, increases over time (Dow, 2010; Houston, Pfefferbaum, & Rosenholtz, 2012).

Just as the sequence of drought affects newspaper coverage of impacts, so too does the physical severity of drought influence the quantity and diversity of that coverage. Levels of newspaper reporting (i.e., number of articles) can peak at the time of highest drought severity, as demonstrated by Dow (2010) who used the PDSI, and Llasat et al. (2009) who used the Standardized Precipitation Index. The diversity of reported impacts similarly increases during most severe drought conditions (Dow, 2010).

While newspaper coverage follows the sequence and severity of drought, impacts are interrelated, often compounding on each other. Changnon and Easterling (1989) described this relationship through a series of first-order impacts (e.g., decreased soil moisture), second-order impacts (e.g., increased crop failure), and third-order impacts (e.g., economic loss). Similar to the meteorological-agricultural drought sequence, first-order impacts result from physical changes in the hydrologic cycle (Changnon & Easterling, 1989). Second-order impacts are linked with reductions in the surface and groundwater supply (e.g., streamflow), affecting activities in the public, commercial, and domestic sectors. Finally, third-order impacts are associated with adjustments made to mitigate first- or second-level impacts and predominantly concern "reductions in high water use activities such as lawn irrigation and car washing" (Changnon & Easterling, 1989, p. 29). Whether a drought impact is physical, social, or some combination of the two, it is critical to evaluate the capacity of newspapers to develop multi-faceted evaluations of drought impacts as they provide practical information for the development of drought monitoring and forecasting strategies at local and national levels (Sonnett, Morehouse, Finger, Garfin, & Rattray, 2006).

The increased complexity and scale of drought impacts, intensified due to climate change, reveal the need for detailed impact and vulnerability reporting that can inform risk management (Dow, 2010). Hazard analysis and risk management require an understanding of the frequency, duration, and spatial extent of drought events as they change over time (Hayes, Wilhelmi, & Knutson, 2004; Llasat et al., 2009). A natural hazard like drought becomes a natural disaster when multiplying hazard impacts against human vulnerability to them (Twigg, 2004), where vulnerability represents the susceptibility to the hazard.

Drought discourse is augmented in news media, which offer a salient source of public commentary on the variable exposure to hazard risks and the ability of a community to cope with drought impacts. To make drought more salient to the public and to help inform decision-making, news coverage should use multiple frames to describe drought. Hazard reporting, including that by newspapers, can increase public anxiety or opposition to drought impacts and affect public trust or support for risk managers and policy decisions (Wakefield & Elliott, 2003). Again, the role of news media is to effectively communicate drought warnings, describe current conditions, and update the public after the physical impacts have subsided (Houston, Pfefferbaum, & Rosenholtz, 2012). Even as the social vulnerability to natural hazard impacts increases (Hayes, Wilhelmi, & Knutson, 2004), newspapers continue to circulate limited information that would actually facilitate public understanding of the associated environmental risks (Major & Atwood, 2004).

Public opinion and climatic change

While climate change and natural hazard issues consistently rank near the bottom of public concern surveys (Brulle, Carmichael, & Jenkins, 2012), the effect of climatic conditions on public opinion is an emerging topic in scholarship. Research has focused on issues such as

belief in or concern for climate change and its increasingly common attendant risks (e.g., Goebbert, Jenkins-Smith, Klockow, Nowlin, & Silva, 2012; Marquart-Pyatt, McCright, Dietz & Dunlap, 2014). Investigations have varied in their approach, analytical techniques, geographic scope, weather/climate indicators, and public opinion measures. The results have also varied. For example, Brulle, Carmichael, and Jenkins (2012) found no influence of weather events on national climate change concern using aggregate weather and public opinion data. Zaval, Keenan, Johnson, and Weber (2014) addressed a limitation in that research, and determined that perceptions of weather have a greater influence on concern regarding climate change than do actual weather conditions. Looking locally, Goebbert et al. (2012) observed a negligible effect of actual temperature change on perceptions of temperature change but a significant effect of precipitation and soil-moisture change on perceptions of the frequency of droughts and floods. Changes in heat and cold, therefore, may be less perceptible than changes in the presence or absence of precipitation, but overall climatic change seems to have little effect on public concern for climate change and its attendant hazards (Goebbert et al., 2012).

Because the relationship between climatic conditions and public opinion is not firmly established, research has identified other and often stronger determinants of public opinion. For example, Marquart-Pyatt et al. (2014) determined the most important predictors of climate change concern are political (e.g., ideology and party identification). However, real-world events and political positions are not the only variables known to have a potential influence on public opinion. Media attention is also an important predictor of concern over climatic changes.

Media attention and climatic change

Public attention to environmental issues is generally increasing (Djerf-Pierre, 2011; Schafer, Ivanova, & Schmidt, 2014), but it also tends to increase and decrease over time in what

Downs (1972) called the issue attention cycle. This theoretical concept assumes that public attention does not remain focused on one issue for long, and it has been shown to influence public opinion (Downs, 1972). The issue attention framework has proven especially useful for scholarship concerning environmental issues and media attention. For example, news coverage of natural hazards can promote other environmental news by "sensitizing the newsrooms to similar and related issues and increasing the general attentiveness to other issues in the [climate change] domain" (Djerf-Pierre, 2011, p. 505). Hasen (2011) found that most recent media attention analyses have focused on climate change, where significant peaks in coverage were correlated with the publication of official reports, as well as with the timing of international meetings and political campaigns. Schafer, Ivanova, and Schmidt (2014) observed similar effects, suggesting that events (e.g., meetings, conferences, official reports) and feedbacks (e.g., citizen complaints, opinion polls, advocate group pressures) from politics drive media attention on climate change. They observed no effect of scientific publications on media attention (Schafer, Ivanova, & Schmidt, 2014).

Weather and climate characteristics are real-world indicators directly related to media attention for climate change. However, studies investigating the link between temperature and media attention found no (Liu, Lindquist, & Vedlitz, 2011; Schafer, Ivanova, & Schmidt, 2014) or only partial (Shanahan & Good, 2000) effects. Temperature is rarely a newsworthy item unless it is woven into a master discourse, like climate change (Hansen, 2011). Drought and other extreme weather events contribute more newsworthy stories than temperature, including drought stories on crop and animal losses and on the attendant economic effects. This is, in part, because drought effects are experienced long after the drought itself becomes unnewsworthy (Ungar, 1999). Still, media attention for long-term, slowly developing hazards is traditionally

low because they lack abrupt events (Schafer, Ivanova, & Schmidt, 2014). Drought is also not inherently part of the larger climate change discourse and is therefore not appropriately addressed in the media.

In summation, the literature reviewed above has analyzed factors that influence media content, media attention, and public opinion. Research that examines the media coverage of hazards, while limited, was supplemented with research on a range of natural hazards, including the broader issue of climate change. Because climate change is a long-term environmental issue affecting the frequency and intensity of droughts, it was also used to identify the relationship between, media coverage, public opinion, and physical indicators for drought. This study, therefore, seeks to fill the gap in scholarly literature on media coverage of geographically distinct, long-term environmental issues.

CHAPTER IV: THEORETICAL FRAMEWORKS AND RESEARCH QUESTIONS

Theoretical frameworks

This study applies two distinct frameworks. It focuses on first-level agenda-setting, the cumulative effect of issue accessibility across media (Scheufele & Tewksbury, 2007), and it focuses on framing, a process of issue selection that increases the salience of individual media messages. Some scholarship has attempted to integrate the theories of agenda-setting and framing. Such integrations suggest that framing is equivalent to second-level agenda-setting (e.g., McCombs & Ghanem, 2001), but their equivalence is still widely contested among scholars (Weaver, 2007). Whereas first-level agenda-setting tells people what to think about (Cohen, 1963), second-level agenda-setting tells people how to think about an issue. Therefore, second-level agenda-setting focuses on the interpretation of issues made accessible through first-level agenda-setting. Because frames can provide the information necessary for individuals to make interpretations about issues, it is often associated with second-level agenda setting. However, this study distinguishes between the processes of framing and second-level agenda-setting, such that framing focuses on issue salience within individual messages and second-level agenda-setting focuses on issue interpretation across a population of messages.

Agenda-setting

This study employs McCombs and Shaw's agenda-setting theory (1972). The theory was originally developed in a political context to investigate the effect of media on the public agenda, but it has since been applied to a wider spectrum of social contexts. In this study, agenda-setting is used to help determine whether local and national newspaper coverage of California's current drought correlates with public opinion in Los Angeles County. McCombs and Shaw (1972)

suggest that what the public view as important can be influenced by the content of newspapers. For example, they found a strong relationship between media emphasis on certain presidential campaign issues and those that voters cited as most important (McCombs & Shaw, 1972). In other words, the media helped set the public agenda concerning politics. Agenda-setting, therefore, can be defined as the ability of news media to influence the prominence of topics on the public agenda (McCombs & Reynolds, 2002). The effect of agenda-setting should not be confused with attitude adjustment. It is unclear whether media can change the attitudes of its audience (McCombs & Shaw, 1972). Instead, it is assumed that audience members learn from the fragmented picture of reality that media produce.

The agenda-setting process includes the public agenda, the media agenda, and the policy agenda (Dearing & Rogers, 1996). This study will concentrate on the primary agenda-setting hypothesis, known as public agenda-setting. This form of agenda-setting focuses on public opinion, and it operates under the same two assumptions as media and policy agenda-setting. First, news media filter and shape reality. Second, news media focus on select topics, which compels audience members to perceive those topics as more important than others. News media, therefore, do not tell people what to think. News media, instead, tell people what to think about (Cohen, 1963).

While media "do not mirror public priorities as much as they influence them" (Ader, 1995, p. 300), some media have a stronger agenda-setting effect. Newspapers, for example, are cited as more effective agenda-setters than television (Ader, 1995; Palmgreen & Clarke, 1977). However, even within these specific media, the functions and scope of coverage can also influence their effect. Media tend to give more play to national news, and it is often perceived as more significant than local news. Palmgreen and Clarke (1977) suggest that the influence of

national media on the public agenda is stronger than the influence of local media. At the local issue level, problems are more visible. Decreased proximity and increased visibility to issues likely limits the influence of media on the public agenda. The public can rely on real-world conditions and interpersonal communication instead (Palmgreen & Clarke, 1977). Real-world conditions, when examined together with media and public agendas, provide a control variable (McLeod, Becker, & Byrnes, 1974; Palmgreen & Clarke, 1977). They assess the sensitivity of news to current conditions and help "distinguish between the effects of news coverage and real-world conditions on public concern for issues" (Behr & Iyengar, 1985, p. 40).

Framing

This study also incorporates components of framing, a theory that focuses on issue selection, emphasis, exclusion, and elaboration (Tankard et al., 2000, as cited in Weaver, 2007). The definitions for framing theory vary among scholars, and frames' utility are dependent on these definitions. This study relies on the definition outlined by Entman (1993) that suggests frames are issues that media select and, thus, make more salient in order to promote a particular interpretation. Entman (1993) and others (e.g., Gamson & Modigliani, 1989) also define a frame as the central organizing idea of a communication text. However, this second definition fails to consider the typical framing scenario where individuals receive multiple frames with varying frequencies within a news article (Chong & Druckman, 2007). It also deemphasizes "the fact that frames are themselves contestable," meaning individuals can accept or resist certain frames depending on their relative strength, frequency, or agreement with the individual's pre-existing beliefs (Sniderman & Theriault, 2004, as cited in Chong & Druckman, 2007, p. 100). Similarly, individuals are generally "unable to amalgamate these frames into a unified representation, and instead are pulled back and forth between impulses triggered by the alternate frames" (LeBoeuf

& Shafir, 2003, p. 89). This study, therefore, does not focus on the presence of one overriding frame. Instead, it focuses on the presence of multiple frames within a newspaper article and the relationships between those frames.

Analyses of framing are incomplete without first accounting for the nature of framing contests within news media. Because (a) previous analyses of drought have not systematically explored how the issue is actually framed in newspapers; (b) drought is a distinct and understudied phenomenon in communication scholarship; and (c) the coverage of frames vary significantly within articles, this study was concerned with the relationship between frames presented in Nisbet (2009). Specifically, it examines cases where two or more frames can reinforce the same message and cases where one frame can reduce media reliance on another frame. Competing frames may also cancel each other, thus reducing the influence on public opinion (Chong & Druckman, 2007).

Drought newspaper coverage should hold true to the underlying science of crescive hazards while also modifying its messages to support the many existing perceptions and values of its newspaper audience (Nisbet, 2009). By incorporating framing theory with the agenda-setting framework, this study examines the agenda-setting influence of both local and national newspaper media on public concern for drought. Using a quantitative content analysis of drought coverage and frames and a survey that identifies public concerns, this study helps determine which level of media is more strongly correlated with public opinion and with natural conditions (i.e., precipitation and soil-moisture levels) over time. The study also helps determine what frames are available to individuals who form opinions about the issue of drought.

Research Questions

As a theoretical framework, agenda-setting allows the potential influence of two levels of

media to be differentiated. It improves the understanding of relationships between public opinion concerning drought and actual coverage of the issue. Agenda-setting demonstrates how media attention of the issue differs, as well as how its salience is distributed temporally and geographically. Analyzing the relationships between media levels and public opinion helps identify the current functions of news media when covering slowly developing local hazards that have national implications.

Based on the abovementioned literature, this study uses newspaper media, public opinion data, and precipitation data. It generates research questions that concern the similarities and differences between two local newspapers (*Los Angeles Times*, *Los Angeles Daily News*) and two national newspapers (*Wall Street Journal*, *New York Times*,). It adds questions that address the role of each newspaper level in setting the public agenda and how that relationship is mediated by physical conditions (i.e., PDSI).

The business-focused *Wall Street Journal* is one of the most widely circulated newspapers in the United States. In third by circulation, the *New York Times* has the largest circulation among metropolitan papers, and it is frequently represented as a newspaper of national record (see Table 1 for more information). The *Los Angeles Times* focuses media coverage on the Los Angeles metropolitan area but is still the fourth largest circulation newspaper in the U.S. The *Los Angeles Daily Times* is a small newspaper by comparison with other metropolitan dailies, but its circulation represents the same geographic area as *Los Angeles Times*. Its coverage, however, focuses largely in the San Fernando Valley, an urbanized area in Los Angeles County that has experienced extreme drought.

Different media systems promote different content to different audiences, selecting and highlighting the significance of some topics while masking others. The level of newspaper and

the nature of the issue itself inevitably influence geographic proximity to an issue and coverage of that area. For a study on the issue of the recent drought, which disproportionately affects the southern region of California, I introduce the following research questions:

RQ1a: What are the similarities and differences in the framing of drought by local and national newspapers?

RQ1b: In what ways and to what extent are different frames co-present in local and national newspapers?

Frames are influenced by the sources used to publicize drought information, and source selection often varies by proximity to an event or condition such as drought, as well as by individual news routines and budget. To study source use, I question:

RQ2a: What are the similarities and differences in the source use by local and national newspapers?

RQ2b: In what ways and to what extent are different sources co-present in local and national newspapers?

The level of newspaper not only influences the attentiveness to local issues of growing national concern, but it also affects the readership population, and more importantly, how that readership's agenda is influenced by news coverage. Therefore, this study addresses public opinion using a survey measure about concern for California state issues. Specifically, it compares public concern for the issue of drought (i.e., public opinion) with the amount of newspaper coverage:

RQ3: To what extent is local and national newspaper coverage related to public opinion?

Natural conditions also affect news coverage since newspapers frequently develop narratives around weather and climatological phenomena that dictate the physical presence of

natural hazards. To further compare and analyze media coverage of drought, it is imperative to observe the relationship between coverage and real-world conditions, specifically:

RQ4: To what extent is local and national newspaper coverage related to natural conditions?

Additionally, it has been debated whether natural conditions are correlated with public opinion. To understand the relationship between public concern for drought and the "reality" of drought conditions, it is necessary to observe the relationship between the two:

RQ5: To what extent are natural conditions related to public concern for drought?

By combining data on news media, public concern, and real-world conditions, this study analyzes the roles of the media-opinion-reality relationship. It answers the abovementioned questions using a quantitative content analysis and correlation statistics.

CHAPTER V: RESEARCH METHODS

This chapter discusses the subject of the study, as well as presenting the methods for data collection, sampling, measurement, reliability, and analysis. The chapter is split into two primary sections, one concerning a content analysis that used data collected in newspapers, and one concerning statistical analysis that used data collected via publically available datasets.

Content analysis

Newspaper data were analyzed using a content analysis method to explain how media cover drought from a local and national perspective where drought impacts are felt differently. News stories from a three-year period (i.e., 2013-2015) were selected to parallel the height of drought conditions in California. The news stories are defined as straight news accounts, excluding opinion-editorial or commentary articles and news briefs. A news story about California's drought is one with sufficient focus on the drought, ranging from one paragraph to a complete narrative on drought, including: "Arid Southwest Cities' Plea: Lose the Lawn" in the *Wall Street Journal* (08/12/13); California Farm Belt Shrivels" in the *New York Times* (06/27/13); "State is drenched, but drought isn't quenched" in the *Los Angeles Times* (12/03/14); and "Farmers' 'senior' water rights under siege" in the *Los Angeles Daily News* (05/28/15).

Data collection

The study's dataset is comprised of newspaper articles from the *Wall Street Journal*, *New York Times, Los Angeles Times*, and the *Los Angeles Daily News*. Circulation was the main criteria for selecting the four newspapers used in this analysis (see Table 1). Both local and national print newspaper levels were selected to account for the similarities and differences in the way drought is framed geographically. The *WSJ* and *NYT* were used to represent the national-level because they are two of the highest circulation newspapers in the nation, they represent

different political leanings, and they play a major role in setting the U.S. news agenda (Althaus & Tewksbury, 2002; Carpenter, 2007). The *LAT* and *LDN* were used to represent the local-level because they are popular Los Angeles dailies that offer direct comparison with the public opinion and climate data that was restricted to the Los Angeles County area.

Table 1

Sample Newspaper Information

Newspaper Name	Founding Year	Daily Circulation	Primary Locality
The Wall Street Journal	1889	2,378,827	Nationwide
The New York Times	1851	1,865,318	Nationwide
Los Angeles Times	1881	653,868	Greater Los Angeles
Los Angeles Daily News	1911 (as *Van Nuys Call*)	56,493	San Fernando Valley

Retrieved from http://auditedmedia.com/news/blog/top-25-us-newspapers-for-march-2013.aspx

Sampling procedure

The ProQuest Newsstand database was used to find and collect news stories because it allowed full access to articles from each of the four newspapers during the entire study period. Drought stories were first isolated using the search phrase "California AND (drought OR "water shortage")." The search dates were January 1, 2012, the year the drought started, through December 31, 2015. Articles with one explicit mention of California-specific drought and one other mention of a drought, precipitation deficit, or water shortage were retained. Editorials, opinion columns, and letters to the editor were removed from the sample after manual examination of the headlines and leads. Other irrelevant news stories included basic weather reports, discussions of drought in other states, and the "California Chrome" racehorse. In total, national newspapers contributed 156 drought articles, 58 from the *WSJ* and 98 from the *NYT*. In total, the local newspapers contributed 415 drought articles, 355 from the *LAT* and *60* from the *LDN*. The 571 articles comprise the full population for this study.

Coding schema and measurement

In addition to newspaper level, date of publication, and article quantity, two additional measurements were employed in the content analysis. They are frames and sources. These measurements were established through a comprehensive review of academic literature and media coverage, and refined in preparation for the development of a coding protocol.

The frames used in this content analysis were adapted from the frame typology described in Nisbet (2009). This frame typology was first identified in a media and public opinion analysis of nuclear energy (Gamson & Modigliani, 1989) and further developed in communication research on biotechonology (Dahinden, 2002; Nisbet & Lewenstein, 2002). While not original to Nisbet, the frame typology focuses on science-related policy debates, and it was adapted for analysis of crescive hazard coverage. In his recent adaptation, Nisbet (2009) redirects the relevance of climate change to properly address a modern media landscape and presents eight frames to help journalists engage the public on climate-related policy issues. "Frames," as a variable, refer to the selection and salience of media content (Entman, 1993). They are repeated messages that highlight one aspect of reality at the expense of another. Drought, like climate change, is a complex slow-onset hazard that can be featured or obscured by media content, and the preliminary review of news articles revealed six of Nisbet's eight frames in drought newspaper coverage. They are: "Economic Development," "Morality and Ethics," "Scientific/Technical Uncertainty," "Pandora's Box/Runaway Science," "Public Accountability and Governance," and "Conflict" (see Table 2).

Each newspaper article was coded for the presence of frames. If the frame appeared in one or more paragraphs, it was coded as present (1); however, if the frame did not appear, it was

Table 2

Frame Definitions (Adapted from Nisbet, 2009)

Frame	Definition	Example
Economic Development	An economic investment or proposed investment has been made, including an economic benefit to infrastructure, or a person, sector, market, or business	"Brown's proposal would also put $2 billion toward storage projects, such as dams and reservoirs" (*LAT*, 03/31/15).
Morality and Ethics	Actions taken are either right or wrong, or they indicate a respect or disrespect for limits, such as regulated water use	"Residents have been doing their part in cutting back…Water use is down 26% from the same time last year" (*LAT*, 06/29/15).
Scientific/Technical Uncertainty	Information about a condition, issue, or event is unknown, such that there is absolutely no understanding of it	"It may take years to resolve the scientific uncertainty" (*WSJ*, 02/17/14).
Pandora's Box/Runaway Science	A need for precaution or action in the face of catastrophe and out-of-control consequences, or alternatively as fatalism, where there is no way to avoid the consequences	"We hope to see more storms… but we have to manage for the worst-case scenario" (*LAT*, 03/06/15).
Public Accountability and Governance	Policy or research is in the public interest, emphasizing issues of control, transparency, participation, responsiveness, or ownership	"Gov. Brown declared a drought emergency and asked the public to cut water use by 20 percent" (*LDN*, 12/02/14).
Conflict	An explicit disagreement among personalities, persons, groups, communities, political parties, or institutions	"Residents disagree fiercely about where that water should come from, or how much more growth should be allowed" (*WSJ*, 08/10/14).

coded as absent (0). All frames were coded for their presence, meaning a newspaper article could present a minimum of zero frames and a maximum of six frames.

These frames are often produced through the use of news sources. Each newspaper article was also coded for the presence of sources. Sources, like frames, were coded as present (1) or absent (0). To be considered a source, the provider was identified with a verb of attribution, which is a statement of direct or indirect communication. Direct quotations were not required for a source to be considered valid. Six source variables were identified in the preliminary review and modified during a pretest of drought newspaper content. They are: "Government/Official," "Business," "Scientist/Expert," "Nonprofit/Advocate," "Citizen," and "Other" (see Table 3).

Coder training and intercoder reliability

Two coders, including the researcher, coded newspaper articles for frames and sources. To identify the presence of frames and sources and to develop a protocol for drought newspaper content, a sample of news articles not included in this study was collected from other local California newspapers, including the Orange County Register, San Diego Union-Tribune, and San Jose Mercury News. These newspapers were selected to avoid contamination of the study sample, and they provided an accurate portrait of the types of frames and sources used in California drought content. Six of Nisbet's (2009) eight frames were clearly identified and six source variables were developed. The researcher then trained the additional coder using the instructions outlined in the protocol, which included variable definitions and use of the codebook. The protocol and codebook were modified during a pretest of 86 articles from the study sample. Changes to the protocol were made after each of round of independent coding to improve agreement. Once coding agreement reached 80 percent between the coders, the

Table 3

Source Definitions

Source	Definition	Example
Government/Official	An agency, or an elected or appointed official, including, politicians, law enforcement officers, and others. An agency whose mission is science (e.g., NOAA) should not be coded as a Government/Official source.	"…said Felicia Marcus, chairwoman of the State Water Resources Control Board" (*WSJ*, 04/08/15).
Business	A person or group that works for a business or industry, including commercial farmers, technology companies, real estate agents, financial and industry consultants, investors and investment officers	"…said Dan Errotabere, a vegetable and nut farmer in Riverdale" (*LDN*, 02/28/15).
Scientist/Expert	A person or group that has technical knowledge or special training, including academics, formal research studies, government agencies whose mission is science (e.g., NOAA), and others	"…said Mike Halpert, deputy director for NOAA's climate prediction center" (*LDN*, 06/11/15).
Nonprofit/Advocate	A person or group that publicly supports or recommends a cause or policy, including environmentalists, associations, councils, think tanks, and general references to democrats or republicans	"…said Laura Allen, co-founder of Greywater Action, a collaborative that leads workshops and presentations on gray water" (*LAT*, 07/04/15).
Citizen	An identifiable person or group that has no cited technical knowledge, special training, or specified place of employment. Citizen sources are typically identified by their proximity to or direct experience with an issue or condition, instead of by their occupation.	"…said Redondo Beach resident Candy Kleven" (*LDN*, 05/13/14).
Other	A person or group that cannot be categorized under the abovementioned source variables, including artists, journalists, editors, entrepreneurs, religious spokespersons, tribal spokespersons, lawyers, attorneys, and others.	"…said James Laube, senior editor for Wine Spectator" (*LAT*, 11/23/14).

discrepancies were resolved between the coders and recoded to avoid contamination of the sample. An intercoder reliability test was then conducted using an additional 80 articles from the 571-article study sample (14%). The coding provided data for a reliability analysis (see Table 4).

Table 4

Intercoder Reliability

Variable	Percent Agreement	Gwet's AC_1
Economic Development	88.8%	.792
Morality and Ethics	91.3%	.825
Scientific/Technical Uncertainty	88.8%	.868
Pandora's Box/Runaway Science	82.5%	.760
Public Accountability and Governance	90.0%	.859
Conflict	88.8%	.822
Government/Official	91.3%	.881
Business	92.5%	.871
Scientist/Expert	91.3%	.841
Nonprofit/Advocate	92.5%	.852
Citizen	96.3%	.942
Other	81.3%	.674

Intercoder reliability was assessed using Gwet's agreement coefficient, AC_1, where "digit 1 indicates the first-order chance correction" (Gwet, 2012, p. 38). AC_1 is an improvement upon Cohen's Kappa and Krippendorff's Alpha in cases where codes lack sufficient variation (Gwet, 2008). For example, the "Scientific/Technical Uncertainty" frame was coded in agreement 89% of the time, yet both Cohen's Kappa and Krippendorff's Alpha were reported as .25. In these cases, inter-coder percent agreement may be high but because variation is low, Cohen's Kappa and Krippendorff's Alpha is also low. As a result, Gwet's AC_1 was adopted for all the dichotomous variables. AC_1 can be interpreted the same as Cohen's Kappa, and one source variable, "Other," did not meet the minimum accepted value of .70. The reliability scores for all other variables were above .75 and within the accepted range.

Data analysis

All coded data were compiled into one data file by the researcher. The data were then transferred to SPSS with added variable descriptions. SPSS was used for data analysis. Specifically, SPSS was used to test research questions and to investigate data patterns using descriptive and inferential statistics. For descriptive statistics, frames and sources were analyzed using frequency distributions and Pearson correlations across newspaper levels and over time. For inferential statistics, a chi-square test was conducted with each frame variable and newspaper level to determine their relationship.

Public opinion and drought data

Public opinion and climate data were acquired outside of the newspaper content to help explain the relationship between media coverage and external variables. The external data were selected from 2013 to 2015 to match the three-year drought period and restricted to Los Angeles County for a localized agenda-setting analysis.

Data collection

This study defines public opinion as the aggregate of public beliefs (Glynn, Herbst, Lindeman, O'Keefe, & Shapiro, 2015). In this case, one aspect of public opinion (i.e., concern for drought) is measured. Public opinion data were obtained from the Public Policy Institute of California (PPIC), a nonprofit, nonpartisan think-tank dedicated to informing policy through research (Available: http://www.ppic.org/survey/). To compare public concern for drought with the amount of related newspaper coverage, the study used one recurring item from the PPIC quarterly surveys: "Thinking about the state as a whole, what do you think is the most important issue facing California?" This survey-based measure ranks public concern over California state issues, such as drought. Survey responses are ranked by percent of respondents who report an

issue to be most important. The average PPIC telephone survey sample included 1,704 adult respondents with a ±3.6 margin of error. In addition, the PPIC further restricted responses to Los Angeles County for use in this study.

Climate data was obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center (Available: http://www.ncdc.noaa.gov/cdo-web/datasets). To quantify drought conditions and to compare them with the amount of related newspaper coverage, the study used Palmer Drought Severity Index values for California's sixth climate division, "South Coast Drainage," which includes Los Angeles County. The PDSI measures drought severity using monthly precipitation and surface air temperature data. It ranges from +10 to -10, with negative numbers indicating a water shortage.

Sampling procedure

During the study period, 16 public opinion surveys were distributed by the PPIC, including reoccurring versions of "Californians and their Government" and "Californians and their Future." News stories form the content analysis were ordered chronologically and placed into one of 16 time periods. Each time period corresponded with the three to four months before

Table 5
Public Opinion Survey Periods

Period	Period Start Date	Period End Date	Survey Dates
01	May 14, 2013	September 9, 2013	Sept 10-17, 2013
02	September 10, 2013	November 11, 2013	Nov 12-19, 2013
03	November 12, 2013	March 10, 2014	Mar 11-18, 2014
04	March 11, 2014	May 7, 2014	May 8-15, 2014
05	May 8, 2014	September 7, 2014	Sept 8-15, 2014
06	September 8, 2014	November 9, 2014	Nov 10-17, 2014
07	November 10, 2014	March 7, 2015	Mar 8-17, 2015
08	March 8, 2015	May 16, 2015	May 17-27, 2015
09	May 17, 2015	September 12, 2015	Sept 13-22, 2015
10	September 13, 2015	November 7, 2015	Nov 8-17, 2015

a quarterly survey, so that the amount of coverage could be compared with the concern for state issues, namely drought (see Table 5). Articles in the first six periods were excluded from the sample because each newspaper had a mean of less than one article per period, and there was no public concern for drought.

Following the same procedure, the PDSI values that represented the last ten survey periods were retained. The mean of the PDSI values for the three to four months before each survey provided one composite PDSI value per period (see Table 6).

Table 6
PDSI Values

Period	Months	Mean PDSI
01	May, Jun, Jul, Aug	-6.64
02	Sept, Oct, Nov	-5.85
03	Nov, Dec, Jan, Feb	-6.26
04	Mar, Apr, May	-7.06
05	May, Jun, Jul, Aug	-8.28
06	Sept, Oct, Nov	-7.33
07	Nov, Dec, Jan, Feb	-6.33
08	Mar, Apr, May	-6.85
09	May, Jun, Jul, Aug	-6.76
10	Sep, Oct, Nov	-5.22

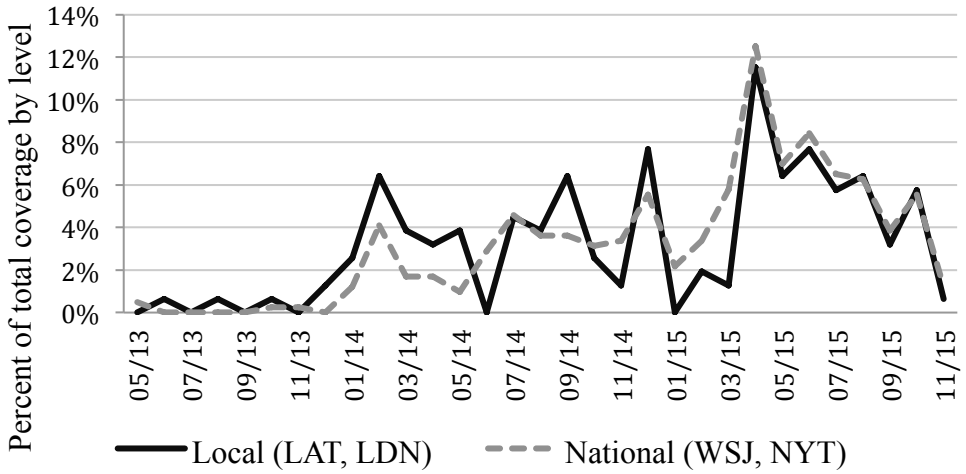
Data analysis

All external public opinion and climate data were compiled into one data file by the researcher. The data were then transferred to SPSS with added variable descriptions. The content analysis data were also added using frame and source frequencies for each survey period. SPSS was used to test research questions and investigate data patterns using a simple descriptive statistic that measures linear correlation between two variables, called Pearson's correlation coefficient.

CHAPTER VI: RESULTS

In this study, two local and two national newspapers were analyzed, including the *Los Angeles Times*, *Los Angeles Daily News*, *Wall Street Journal*, and the *New York Times*. Across the four newspapers, 571 articles were coded. Together, the local newspapers accounted for 72.7% (n=415) of the total drought coverage, whereas, the national newspapers accounted for 27.3% (n=156) of the sample. The difference in article quantity between local and national newspapers can be attributed to the physical proximity to drought conditions and the availability of local sources. The internal differences between local newspapers' article quantity (i.e., *LAT*=355, *LDN*=60) can be attributed to geographic focus (see Table 1), drought-reporting budget, and *LDN*'s commitment to business, education, and crime issues in the San Fernando Valley. Similarly, the internal differences in article quantity between national newspapers (i.e., *WSJ*=58 and *NYT*=98) can be attributed to each newspaper's orientation, where the business-focused *WSJ* takes on a more conservative political stance than *NYT*.

Figure 1
Trends in Amount of Drought Coverage



Frequency distribution

The investigation of newspaper coverage began with the temporal component of drought, specifically how the amount of coverage fluctuated over the natural hazard's prolonged duration. Descriptive statistics were used to determine the frequency distribution of articles over the three-year period. The study was interested in the frequency of articles by period for comparison with the PPIC survey measure and the frequency of articles by month for comparison with the PDSI. The frequency of articles rose and fell over time, but the general trend for both newspaper levels was upward until both the local and national coverage peaked during period 09 (see Figure 1). This peak of coverage coincides with the first-ever 25% statewide water use reduction mandate enacted by Governor Brown in April of 2015.

Climate frames

There are both similarities and differences in the way local and national newspapers frame drought. RQ1a asked whether similarities or differences in the framing of drought existed between articles at each level of newspaper. A chi-square test of independence was conducted with each frame variable and newspaper level. The test was significant for three frame variables, indicating a relationship between newspaper level and the "Economic Development," "Morality and Ethics," and "Conflict" frames. Of all national articles (n = 156), 39.7% used the "Economic Development" frame, whereas only 29.9% of all local articles (n = 415) used it. This means the presence of the "Economic Development" frame is significantly dependent on newspaper level, X^2 (5, N = 571) = 5.02, p < .05. Similarly, of all national articles (n = 156), 53.2% used the "Morality and Ethics" frame, but 41.2% of all local articles (n = 415) used it. "Morality and Ethics," therefore, is also significantly dependent on newspaper level, X^2 (5, N = 571) = 6.61, p = .01. Finally, of all national articles (n = 156), 39.7% used the "Conflict" frame, and 23.4% of all

local articles (n = 415) used it. Thus, the third significant and dependent relationship was observed between "Conflict" and newspaper level, X^2 (5, N = 571) = 15.12, p < .01. The presence of the three remaining frame variables, including "Public Accountability and Governance," "Pandora's Box/Runaway Science," and "Scientific/Technical Uncertainty," were not dependent on newspaper level.

Across both levels, "Public Accountability and Governance" was the most commonly used frame (see Table 7). News reporting, therefore, focused on actions enacted to mitigate drought effects, including mandated water restrictions, short-term aid, water delivery, and applied research. The second most common frame among newspaper levels was the "Morality and Ethics" frame. "Morality and Ethics" implies an action taken was either right or wrong, and it can indicate a respect or disrespect for thresholds, including wasteful water use. Among local newspapers, the "Economic Development" frame, which includes long-term investments such as infrastructure improvement, was the third most common, and the "Conflict" frame, which focuses on a disagreement or debate, was fourth most common. "Economic Development" and "Conflict" were tied as the third most common frames among national newspapers. The fifth

Table 7

Frame Distribution

	Local Newspapers (n = 415)			National Newspapers (n = 156)		
Frame	Frequency	%[a]	%[b]	Frequency	%[a]	%[b]
Economic Development	124	15.3	29.9	62	16.45	39.7
Morality and Ethics	171	21.2	41.2	83	22.0	53.2
Scientific/Technical Uncertainty	42	05.2	10.1	15	04.0	9.6
Pandora's Box/Runaway Science	53	06.6	12.8	25	06.6	16.0
Public Accountability and Governance	321	39.7	77.3	130	34.5	83.3
Conflict	97	12.0	23.4	62	16.45	39.7
Total	808	100		377	100	

[a] Frame proportions over all frame mentions
[b] Frame proportions over all newspaper articles

most common frame between both newspaper levels was the "Pandora's Box/Runaway Science" frame. News reports containing this frame, though less common, suggested a call to action in the face of catastrophic drought and out-of-control precipitation deficits. The sixth and least common frame reported among newspaper levels was "Scientific/Technical Uncertainty."

The relationship between frames also varied significantly within newspaper levels. In response to RQ1b, which asked about the co-presence of frames, both "Economic Development" and "Conflict" were significantly correlated across local [$r = .100$, $n = 10$, $p < .05$] and national [$r = .197$, $n = 10$, $p < .05$] newspapers. This means as mentions of long-term investments or infrastructure changes increased, so did mentions of political or individual conflict. "Conflict" was also significantly correlated with "Accountability and Governance" across local [$r = .204$, $n = 10$, $p < .01$] and national [$r = .187$, $n = 10$, $p < .05$] newspapers, suggesting that coverage of drought mitigation actions was often paired with a disagreement or debate. At the local-level, the "Economic Development" frame is significantly correlated with "Public Accountability and Governance" [$r = .152$, $n = 10$, $p < .01$] and "Morality and Ethics" [$r = .245$, $n = 10$, $p < .01$]. Therefore, as local coverage of investments or infrastructure increased, so did coverage of drought mitigation and moral responses. The strongest co-presence of frames was between the "Public Accountability and Governance" and "Morality and Ethics" frames at the local-level [$r = .254$, $n = 10$, $p < .01$]. This means an action taken by a governing body or the public was frequently evaluated in local news reports. "Morality and Ethics" was also significantly correlated with "Conflict" [$r = .116$, $n = 10$, $p < .05$] at the local-level, meaning as mentions of moral responses increased, so did mentions of conflict. At the national-level, "Economic Development" was significantly correlated with "Pandora's Box/Runaway Science" [$r = .217$, $n = 10$, $p < .01$], suggesting that mentions of long-term investments or infrastructure changes were

related to calls for action in the face of catastrophic drought or out-of-control precipitation deficits.

News sources

There are similarities and differences in the way local and national newspapers use sources. RQ2a asked whether similarities or differences in the source use existed between articles in each newspaper level. A chi-square test of independence was conducted with each source variable and newspaper level. The test was significant for two source variables, indicating a relationship between newspaper level and "Business" and "Other" sources. Of all national articles (n = 156), 48.1% cited "Business" sources, whereas only 22.7% of all local articles (n = 415) cited them. This means the use of "Business" sources was significantly dependent on newspaper level, X^2 (5, N = 571) = 35.18, p < .01. The use of "Other" sources, while also dependent on newspaper level, was overlooked due to low intercoder reliability (AC_1 = .674). Therefore, the presence of the four remaining source variables, including "Government/Official," "Scientist/Expert," "Nonprofit/Advocate," and "Citizen, were not dependent on newspaper level.

Across both levels, "Government/Official" sources were the most common, followed by "Scientist/Expert" sources (see Table 8). The third most common source within local coverage is the "Nonprofit/Advocate" source, and for national coverage, "Business" sources were the third most common. Among the fourth most common sources for newspapers are "Citizen" sources for local coverage and "Nonproft/Advocate" sources for national coverage. "Business" sources were the fifth most common among local newspapers, and the "Other" uncategorized sources were fifth among national newspapers. The least common source used in local coverage was "Other," while national newspapers cited "Citizen" sources least frequently.

Table 8

Source Distribution

	Local Newspapers (n = 415)			National Newspapers (N = 156)		
Source	Frequency	%[a]	%[b]	Frequency	%[a]	%[b]
Government/Official	322	32.1	77.6	129	28.8	82.7
Business	94	09.4	22.7	75	16.7	48.1
Scientist/Expert	262	26.1	63.1	99	22.1	63.5
Nonprofit/Advocate	160	15.9	38.6	61	13.6	39.1
Citizen	96	09.6	23.1	39	08.7	25.0
Other	69	06.9	16.6	45	10.1	28.9
Total	1003	100		448	100	

[a] Source proportions over all source mentions
[b] Source proportions over all newspaper articles

In response to RQ2b, which asked about the co-presence of sources, both "Business" and "Nonprofit/Advocate" sources were significantly correlated across local [$r = .186$, $n = 10$, $p < .01$] and national [$r = .254$, $n = 10$, $p < .01$] newspapers. That is, as "Business" source use increased, so did "Nonprofit/Advocate" source use. Similarly, "Business" and "Citizen" sources were significantly correlated across local [$r = .222$, $n = 10$, $p < .05$] and national [$r = .215$, $n = 10$, $p < .05$] newspapers. In local-level newspapers, "Scientist/Expert" sources were significantly correlated with "Government/Official" [$r = -1.83$, $n = 10$, $p < .01$] and "Citizen" [$r = .099$, $n = 10$, $p < .01$] sources, suggesting that as more "Scientific/Technical Expert" sources were cited, less "Government and Official" and more "Citizen" sources were cited. At the national-level, significant correlations between "Other" sources and "Nonprofit/Advocate" or "Citizen" sources were overlooked due to low intercoder reliability ($AC_1 = .674$).

Public opinion

This study employed McCombs and Shaw's (1972) public agenda-setting framework to investigate the relationship between the frequency of drought newspaper coverage and public concern for drought. To answer RQ3, about how the amount of coverage relates to public

opinion in Los Angeles County, a Pearson correlation test was conducted between newspaper levels and public opinion using the survey period as the case. Public opinion was lagged by one period to account for the delayed response of survey respondents to the amount of newspaper coverage. The test was significant for local-level newspapers, indicating a strong correlation between the amount of coverage in local newspapers and public concern for drought [$r = .777$, $n = 9$, $p < .05$]. The amount of coverage in national-level newspapers was moderately correlated with public concern for drought, though it was not significant [$r = .589$, $n = 9$, $p > .05$].

Natural conditions

While increased drought coverage had a potential agenda-setting effect on public opinion in Los Angeles County, drought severity did not. RQ4 asked about the relationship between the amount of coverage and natural climatic conditions indicated by the PDSI for California's sixth climate division, which includes Los Angeles. To measure this relationship, a Pearson correlation test was conducted between each newspaper level and natural conditions using month as the case. Monthly article frequency and drought severity data provided a more precise comparison than could have been achieved using the ten survey periods. The amount of coverage was lagged by one month to account for the delayed response of newspapers to drought conditions. The test was not significant, indicating no correlation between the amount of coverage and natural conditions for local-level newspapers [$r = -.247$, $n = 9$, $p > .05$] and for national-level newspapers [$r = -.279$, $n = 9$, $p > .05$].

To account for the potential effect of drought severity on public opinion, RQ5 asked whether natural climatic conditions in California's sixth climate division were related to public concern for drought in Los Angeles County. Another Pearson correlation test was conducted to measure this relationship between "Public Opinion" and "Natural Conditions" with "Period" as

the case. Public opinion was lagged by one period to account for the delayed response of survey respondents to drought conditions. The test was not significant, indicating no mediating effect and no correlation between drought severity and public opinion [$r = 0.048$, $n = 9$, $p > .05$].

CHAPTER VII: CONCLUSIONS

Summary of comparisons

The results indicate several conclusive similarities and differences between local-level and national-level newspapers' coverage of California's recent historic drought:

1. Local and national newspaper coverage increased over the course of the drought until reaching peak coverage during the first ever statewide water reduction mandate in April of 2015.
2. Local and national newspapers framed "Economic Development," "Morality and Ethics," and "Conflict" coverage differently. Each frame was reported more frequently by national newspapers than by local newspapers, suggesting a significant divergence in focus of coverage between the two levels.
3. "Public Accountability and Governance" and "Morality and Ethics" were among the most common climate frames used in coverage across newspaper levels. This means newspapers focus on drought mitigation actions and personal or group responses to limits imposed by the drought. "Pandora's Box/Runaway Science" and "Scientific/Technical Uncertainty" are among the least common climate frames used across newspaper levels, meaning newspapers do not focus on uncertain or out of control issues, such as when the drought will end.
4. Local and national newspapers cited "Business" sources differently. National newspapers cited "Business" sources more frequently, suggesting a significant reliance on businesses and commercial farmers for source material.
5. "Government/Official" and "Scientist/Expert" sources were among the most commonly cited sources, meaning newspapers across each level relied heavily on elite sources.

"Citizen" sources were one of the least commonly used sources by local and national news.

6. Increased drought newspaper coverage has an agenda-setting effect on public concern for drought. The amount of local-level newspaper coverage, in particular, is significantly correlated with public opinion. The amount of national-level newspaper coverage has a moderate though insignificant effect.
7. Meteorological drought severity has no mediating effect on the amount of drought coverage. It also does not have a significant effect on public concern for drought.

Discussion

Using a quantitative content analysis, this study applied public agenda-setting theory to test factors that affected the performance of different newspaper levels in reporting drought. It compared coverage of local-level and national-level newspapers, including the use of frames adapted by Nisbet (2009) for climate change. The findings support the agenda-setting effect of local drought coverage on public opinion and revealed the differing uses of frames and sources in newspaper content.

Setting the drought agenda

The number and variation in number of articles dedicated to drought coverage are important factors in predicting the public agenda in Los Angeles County. It is likely that media attention to drought and drought mitigation drove public attention in Los Angeles, such that an increase in coverage was related to an increase in concern over drought and its associated water shortages. This finding supports what McCombs and Shaw (1972) originally termed the public agenda-setting effect. Following their theoretical framework, newspapers filter reality by selecting newsworthy topics and assign issue-importance based on the relative number of times

that topic was mentioned. During the study period, 2013-2015, drought was considered a newsworthy topic, especially among local-level newspapers, and it was reported on with increasing frequency. This frequency was driven, in part, by four major drought events, including state water cuts to agencies and a federal announcement for aid in February 2014, heavy rainstorms in December 2014, and the first ever statewide water reduction mandate in April of 2015 (see Figure 1). Despite this event-centric focus, local newspapers made drought more prominent in coverage and were able to put drought on the local public agenda.

Differences between newspaper levels, particularly between the local and national levels, can account for differences in the strength and significance of the agenda-setting effect. This difference in effect can also be expected to influence the development of perceptions concerning topics at these levels. For example, more coverage is typically given to national issues due to their wide-ranging importance. Local issues are also more directly observable, meaning newspapers are not always required to form opinions about local issues. These differences support the stronger agenda-setting effect of national news (Palmgreen and Clarke, 1977). The findings in this study, however, contradict that relationship outlined in Palmgreen and Clarke (1977). This contradiction is likely due to their focus on political issues rather than on an environmental issue, like drought, which can vary in its relative obtrusiveness.

Unlike other local issues, there is delayed sense of immediacy with drought. This is because drought develops gradually, and its onset is virtually undetectable. Drought does not become obtrusive until after it is given significant media attention or after prolonged precipitation deficits make it a political issue. It is, therefore, important to consider drought a distinct case with cross-level significance. For example, the effects of drought on California's agriculture are important at both the local and national level. At the local level, the drought

influences the availability of agriculture-related jobs and the amount of water permitted to different sectors. At the national level, the drought drastically influences U.S. reliance on agricultural imports of vegetables, fruits, and nuts (CDFA, 2016). When the cross-level significance of drought is combined with high community interest in local news and weather (Miller et al., 2012), drought becomes a salient topic, despite its delayed obtrusiveness. Therefore, the influence of local newspaper coverage on public concern for drought received strong support in this study, as evidenced by a significant correlation between the amounts of local coverage and the proportion of PPIC survey respondents in Los Angeles who designated the drought issue as most important. The findings also show the strong role of local newspapers in disseminating information that could be used by readers to determine personal risk or concern for an imminent or developing drought.

Drought severity, which reflects natural conditions, is not related to the amount of coverage across newspapers. It is also not an important predictor of public concern concerning drought. Severity was measured using the PDSI, the most prominent meteorological scale for drought. During the study period, drought in California's sixth climate division varied from severe conditions (-5.00 to -7.49) to extreme conditions (-7.50 to -10.00). The drought was recorded at its most "extreme" in July of 2014, with a PDSI of -8.70. The drought was recorded at its least "severe" in November of 2015, with a PDSI of -5.16. Despite the severity and increasing visibility of drought over the study period, there was not a significant correlation observed with the amount of newspaper coverage. This lack of correlation may be the result of low variance in the PDSI. At no time during the study period did the PDSI reach normal conditions, nor has the PDSI registered a positive value (i.e., wet condition) since November 2011. The delayed progression of drought likely made it less perceptible. This delay meant that

concentrated newspaper coverage did not begin until May 2013, one year after the drought formally began, when the PDSI had already reached -6.12.

The PDSI is based on a physical water-balance model, meaning it considers both precipitation and surface air temperature (Dai, 2016). The lack of correlation observed between drought severity and amount of newspaper coverage largely supports Shanahan and Good (2000), who observed a weak effect of temperature on media attention. Temperature, a real-world indicator, is known to have little to no influence on public concern over climatic changes (Brulle, Carmichael, & Jenkins, 2012; Goebbert et al., 2012), which supports the lack of correlation observed between the PDSI and public concern for the issue of drought. In addition to measuring temperature and precipitation, the PDSI can also be considered a soil-moisture indicator (Szep, Mika, & Dunkel, 2005). Goebbert et al. (2012) observed a significant effect of precipitation and soil moisture on local public opinion about drought, but they suggested it fiercely competes with ideology and political orientation "for primacy in shaping public opinion" (p. 142). In the case of California's recent historic drought, it is likely, then, that real-world indicators not measured by the PDSI (e.g., public policy) took precedence in shaping the public and media agenda.

Framing drought discourse

Frames are interpretive narratives used, in this case, by journalists to promote specific conditions of drought. They can designate problems (i.e., "Conflict" and "Scientific/Technical Uncertainty"), attribute responsibility for those problems (i.e., "Morality and Ethics" and "Pandora's Box/Runaway Science"), and suggest remedies (i.e., "Public Accountability and Governance" and "Economic Development"). Observed differences in drought framing suggest that local and national newspapers promote distinct narratives. National newspapers more

frequently promote narratives surrounding "Conflict," "Morality and Ethics," and "Economic Development" than do Los Angeles newspapers. This finding supports the observed tendency of local newspapers to avoid conflict frames in an attempt to build social cohesion (Carpenter, 2007; Evans & Riffe, 2015). It also suggests that national newspapers focused on moral issues and responses to drought conditions, including the ability of Californians to conserve water and build infrastructure for water delivery. However, for every frame that is dependent on newspaper level, there is another frame used similarly between levels. The most common frame, "Public Accountability and Governance" was reported evenly across newspapers. This cross-level focus on policy and applied research suggests that newspaper media report on drought like other natural hazards, confining drought issues to discrete events using episodic frames that deemphasize its crescive nature. It also suggests that newspapers hold the agriculture industry and citizens most accountable for unsustainable water use. Similar and infrequent use of "Scientific/Technical Uncertainty" and "Pandora's Box/Runaway Science" frames, implies that local-level and national-level newspapers tend to rely on concrete frames, which help create consensus about drought and highlight the actions (i.e., "Public Accountability and Governance") necessary to address it.

The co-presence of frames can also affect the salience of drought conditions, such that two frames can reinforce a similar theme (e.g., "Conflict" and "Public Accountability and Governance"). There are twice as many significant local newspaper frame combinations as national newspaper frame combinations. The strongest correlations among local newspaper frames are between "Economic Development" and "Morality and Ethics" and between "Public Accountability and Governance" and "Morality and Ethics." The co-presence of these frames suggest that when local newspapers discuss actions and investments made to mitigate drought

impacts, they also discuss local citizens' responsiveness to limits imposed by drought. This finding likely stems from the tendency of local newspapers to discuss drought as a manageable socioeconomic issue, rather than as an unmanageable meteorological one. In contrast, the strongest correlation among frames in national newspapers is between "Economic Development" and "Pandora's Box/Runaway Science." This co-presence suggests that national newspapers tend to use "Economic Development" as a means to discuss options for mitigating out-of-control drought conditions. Despite these differences, local and national newspapers share two significant frame combinations, including "Economic Development" and "Conflict" and "Public Accountability and Governance" and "Conflict." It can be expected, then, that newspaper levels give value to the "Conflict" associated with drought mitigation actions including investments. Co-presence of frames within and across newspaper levels not only highlights their use but also their function within the larger drought discourse.

Newspaper frames can also be influenced by the selection of sources. Like frames, sources promote one or more viewpoints at the expense of others. Although source use often varies across newspaper levels due to production routines and geographic proximity, the use of official sources is common across all levels (Carpenter, 2007). This is reaffirmed in the study, such that "Government/Official" sources were most common, "Scientist/Expert" sources were second most common, and use of "Business," "Nonprofit/Advocate," "Citizen," and "Other" sources varied across levels. This heavy dependence on official or elite sources has been a regular criticism of newspapers, which regularly select them because of time constraints, ease of access, and institutional pressures (Carpenter, 2007). However, the inclusion of official and expert sources in drought coverage can indicate credibility (Carpenter, 2007), which is likely needed to discuss the complex natural hazard. The observed differences in the other four sources

used suggest that local and national newspapers rely on distinct voices. This is especially true with "Business" sources, which were more frequently cited among national newspapers. This tendency supports the moderate use of "Economic Development" frames across newspaper levels, and implies that national newspapers, more than local ones, encourage messages from business owners and commercial farmers, whose operations have been impacted by the drought.

The co-presence of sources likely affects the social, political, or economic positions taken on drought, such that two sources can encourage the same message (e.g., "Business" and "Nonprofit/Advocate"). In fact, the strongest correlations across newspaper levels were between "Business" and "Citizen" and between "Business" and "Nonprofit/Advocate" sources. The co-presence of these sources suggest that when newspapers cite business owners or commercial farmers they also cite local sources. This tendency can suggest that newspapers endeavor to localize drought through locally invested voices, or it can suggest an attempt to balance source use. However, the relationship between sources can also be the opposite, such that reliance on one source can reduce the amount of attention allotted to another source. This is true of "Government/Official" and "Scientist/Expert" sources across local newspapers. That is, local drought coverage favors the use of one elite source type per article.

While the *LAT*, *LDN*, *WSJ*, and *NYT* were aggregated into local or national news levels, the research questions did not address the potential in-level variance. On the whole, a frequency test revealed minimal differences between *LAT* and *LDN,* the local news aggregate, and it also revealed minimal differences between *WSJ* and *NYT*, the national news aggregate. The largest differences between uses of local newspaper frames included "Public Accountability and Governance" (12.5%) and "Conflict" (9.8%). The largest differences between uses of national newspaper frames included "Pandora's Box/Runaway Science" (14.5%) and "Conflict" (19.3%).

There was less in-level variance with newspaper sources, and the largest difference in source use was with "Citizen" sources (9.6%) between national newspapers. While this is a limitation that should be addressed in future research, the in-level differences were likely due to a low number of articles using that particular frame or source.

Practical implications

This study provides several practical implications for drought reporting based on a comparison of local and national newspaper coverage of the 2013-2015 drought in California. First, the study suggests that increased drought coverage has a public agenda-setting effect on local opinion. Media attention on and public concern for drought, however, were significantly delayed. That is, the majority of drought coverage was reactionary, focusing on the alleviation of drought impacts rather than on hazard preparation. This also means drought was not a significant state issue of concern until March 2014, more than one and a half years after the PDSI registered repeated drought values. News coverage did accurately cite the 2012 onset of drought, but delayed coverage was likely due to the lack of "newsworthy" events frequently associated with other natural hazards. It was also likely due to the slow-onset of drought obtrusiveness (i.e., impacts to agricultural, public, commercial, and domestic sectors). To diminish this delayed response to drought, local and national newspapers should follow and report on climate indices, which often consider precedent conditions, rather than on temperature and precipitation data alone. Newspapers should also create "drought beats," so that coverage can be woven into critical master discourses that do not rely so heavily on events. In doing so, newspapers can support a precautionary discourse and influence public concern before drought impacts appear. Second, the study suggests that the California drought represents a distinct case where a localized climate phenomenon generates national impacts. Drought is both a local and national

topic of interest, but it is discussed differently across levels. National newspapers will likely continue to encourage business and economic coverage more than local newspapers because the U.S. is uniquely invested in California's agriculture industry. However, if national newspapers desire to influence public opinion, they need to build a cohesive discourse around local drought issues. Finally, it is important for journalists to understand that the selection of topics for attention (i.e., drought) and the selection of attributes for thinking about these topics (i.e., frames and sources) are both critical components of the agenda-setting process (McCombs & Ghanem, 2001).

Limitations and suggestions for future research

A major obstacle in comparative research is measuring the equivalence of newspapers. While national newspapers are expected to have a large circulation and wide influence, local newspapers can vary significantly in their circulation and influence. For example, the circulation for *LAT* was over ten times the circulation for *LDN*, and *LAT* has more than twice the amount of articles dedicated to drought. Circulation, however, does not imply readership and should be included in future drought communication research.

This study was also limited by its timeframe, which was largely dependent on media coverage, monthly PDSI values, and quarterly surveys. The delay in media attention to drought meant only 10 survey periods could be analyzed, which may not have been enough time to observe significant variance in the PDSI.

Similarly, the PDSI lacks the additional timescale features of other climate indices, and it assumes that precipitation is immediately available (Dai, 2016). This makes correlations with delayed but visible water resources like runoff and snowpack difficult. Choosing the PDSI as a drought severity indicator also narrowed "reality" to one view, and the public likely uses

multiple views to make informed decisions about natural hazards. Future research on drought communication should therefore test other indictors of reality for correlations, including additional climate indices, published research, reservoir levels, newspaper readership statistics, and water utility notices. Each indicator could contribute a different view of the same reality.

Additionally, the role of government activity (e.g., meetings, speeches, hearings, or legislative action) was not addressed in this research. Because it likely has an impact on media-opinion-reality relationships, it should be addressed in future analysis of drought coverage.

Future research could also expand the number of local and national newspapers included in the sample. California's sixth climate division, for example, is not limited to Los Angeles County. It also includes Santa Barbara, Ventura, Orange, and San Diego Counties, from which additional metropolitan dailies could be selected for comparison. This would allow for a more robust analysis of local coverage.

Finally, this study aggregated local coverage of drought and compared it with national coverage. Future studies could further investigate the local coverage by focusing on each of the seven climate divisions within California. This would help refine the significant agenda-setting effect of local media on public concern for drought.

APPENDIX

Appendix

Coding Protocol

This news story protocol was developed to examine the differences in newspaper framing of the current California drought. It uses articles from newspapers with a national focus and circulation, as well as articles from newspapers with a local focus and circulation. The study considers how a newspaper's proximity to drought affects the way the natural hazard is framed in articles and, alternatively, how closely the number of articles correlates with public concern and natural drought conditions.

A drought article is defined as a straight news story with one explicit mention of California and its current drought, as well as one subsequent mention of drought, a water shortage, or a precipitation deficit. This excludes editorial, opinion, or commentary articles. It also excludes news briefs and articles in the question and answer format.

Coding Instructions

Please read this protocol in its entirety to familiarize yourself with the variables you will identify and code as part of your responsibility in this study. In so doing, please carefully read each variable definition, description, and examples when they are provided. This protocol should be re-read at the start of each coding session, and each session should last a maximum of three hours. As a coder, you should observe a ten-minute break after every hour of coding to help maintain focus and coding precision. However, never observe a break while in the process of coding an article.

After reviewing this protocol at the start of each session, proceed to coding. Each article should be read and coded in the order that it was received. To be a successful coder, first read an article in its entirety, and, on a second run through, code the articles for the unassigned variables listed below. Repeat these steps for each article, and make certain that only one article is coded at a time. This will preserve attention to detail and allow each article to be viewed individually, without respect to the others presented in the census sample. Note: All drought and non-drought content should be coded for the unassigned variables.

V01 – Newspaper Level (Assigned)

Record the one-digit code that corresponds with the newspaper where the story appears. *Wall Street Journal* is "1," *New York Times* is "2," *Los Angeles Times* is "3," and *Los Angeles Daily News* is "4."

V02 – Period ID (Assigned)

Record the one-digit code that represents the time when the story appeared in the newspaper. There are 10 time periods, each corresponding with a quarterly survey of public opinion in Los Angeles County. These time periods also correspond with the timing of California's current drought, which started in 2012 and continues today.

01 – May 14, 2013 to September 9, 2013
02 – September 10, 2013 to November 11, 2013
03 – November 12, 2013 to March 10, 2014
04 – March 11, 2014 to May 7, 2014
05 – May 8, 2014 to September 7, 2014
06 – September 8, 2014 to November 9, 2014
07 – November 10, 2014 to March 7, 2015
08 – March 8, 2015 to May 16, 2015
09 – May 17, 2015 to September 12, 2015
10 – September 13, 2015 to November 7, 2015

Frames

Frames are phrases, sentences, or paragraphs that highlight some aspect of reality to provide clarity and to suggest an order of issue importance. Frames vary in length and in purpose. One frame is not best, and multiple frames can be used in a single news story, paragraph, or sentence to provide a coherent narrative.

For each frame variable, record "1" signifying that "Yes," the frame is present in one or more story sentences. Record "2" for "No" if the frame is not present.

V03 – Economic Development Frame

"Economic Development" frames suggest a long-term economic investment, proposed investment, or aid has been made. Economic development frames may also indicate an economic benefit to infrastructure, or a person, sector, market, or business. Economic development frames include the drilling of wells, even if the drilling effort provides no water. For short-term aid or spending (e.g., water delivery) code instead as public accountability and governance (V07).

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "Rebate programs provide money to homeowners for everything from installing 'smart' sprinklers to ripping out lawns"
- "Invested $7.5 billion in projects to increase water storage, water recycling and treatment"
- "Unveiled $700 million emergency drought-relief proposal to help residents struggling with record-dry conditions and to fund updates to the state's water infrastructure"

V04 – Morality and Ethics Frame

"Morality and Ethics" frames suggest actions taken are either right or wrong. Morality and ethics frames may also indicate a respect or disrespect for limits or thresholds.

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "During past episodes of tightened supply, residents have responded well"
- "That 20 percent threshold wasn't reached statewide until December"
- "Urban agencies didn't step up as much as they should be stepping up"
- "Voluntary reductions have produced limited results"
- "Conservation efforts have fallen short and use reductions have hovered at less than 10 percent"

V05 – Scientific/Technical Uncertainty Frame

"Scientific/Technical Uncertainty" frames suggest information related to a condition, issue, or event is unknown, such that there is absolutely no understanding of it.

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "While there is no immediate threat of water-supply interruptions, the duration of the state's drought is unknown"

V06 – Pandora's Box/Runaway Science Frame

"Pandora's Box/Runaway Science" frames suggest a need for precaution or action in the face of catastrophe and out-of-control consequences, or alternatively as fatalism, where there is no way to avoid the consequences.

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "This will be an ongoing crisis and we need to assist our residents and businesses in ongoing behavioral changes"
- "The drought is far worse than what California has experienced in the past and something must be done before summer"
- "We can be better prepared for the terrible consequences that California's drought now threatens"
- "If Californians can't conserve enough, water managers will have to create new sources, or pray that Mother Nature delivers it sooner rather than later"

V07 – Public Accountability and Governance Frame

"Public Accountability and Governance" frames suggest research or policy is in the public interest. Public accountability and governance frames may emphasize issues of control, transparency, participation, responsiveness, or ownership. Alternatively, public accountability and governance frames include short-term aid or spending (e.g., water delivery).

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "Gov. Brown declared a drought state of emergency"
- "Gov. Brown directed state agencies to cut back on water usage"
- "They voted to extend emergency water use rules and add new ones"
- "Residents will have to keep their water use to 68 gallons per person each day or face fines"
- "It calls on California residents to voluntarily reduce their water consumption by 20 percent"
- "Water from the wet north was delivered to the dry south through a maze of dams and aqueducts"

V08 – Conflict Frame

"Conflict" frames suggest an explicit disagreement or debate among personalities, persons, groups, communities, political parties, or institutions. Conflict frames often indicate who is winning or losing a debate, or reveal critics of an issue or policy. To code for the presence of this frame, both sides of the "Conflict" should be indicated. Additionally, "skepticism" should not be considered a disagreement.

1 – Yes, the frame is present
0 – No, the frame is not present

Examples:

- "The board approved the measure 5-1, with the Vice President opposing"
- "46 percent disagree that the state should help farmers by easing environmental regulations"

Sources

To be considered a source, the provider will be identified with a verb of attribution, which is a statement of direct or indirect communication. Direct communication in news stories is determined by verbs or attributions such as "said," "reported," "stated," and "noted," while indirect communication includes verbs related to mental states such as "hopes," "feels," and "believes." Direct quotations are not required for a source to be considered valid. "According to," "estimated," and "ranked" should also be considered a verb of attribution. If a source is quoted twice with additional source-type information, retain only the first code.

If source information references the employer and the position, code for the employer. Additionally, survey and poll respondents should not be coded as sources because their responses are dictated by the survey and poll questions. In other words, the survey itself is the source that should be coded.

For each source variable, record "1" signifying that "Yes," the source is present in one or more story sentences. Record "0" for "No" if the source is not present.

V09 – Government/Official Source

A "Government/Official" source is an identifiable agency, or an elected or appointed official within government, including, politicians, law enforcement officers, and others. All water utilities and related representatives should be coded as "Government/Official" sources. Additionally, a government agency whose mission is science should be coded as a Scientist/Expert source, not as a Government/Official source. See the provided examples for assistance.

1 – Yes, the source is present
0 – No, the source is not present

Examples:

City Manager City Planner Dept. Forestry and Fire Protection Dept. of Agriculture Dept. of Conservation Dept. of Parks and Recreation Dept. of Public Health Dept. of Water and Power Fire Official Governor Irrigation District Mayor	Mutual Water Company Office of Emergency Services Police Officer President State Parks State Water Resources Control Board US Bureau of Reclamation Utility Manager Water Authority Water Board Water District Water Utility Company

V10 – Business Source

A "Business" source is an identifiable person or group that works for a business or industry, including commercial farmers, real estate agents, technology consultants, financial consultants, investment officers, investors, and industry consultants.

1 – Yes, the source is present
0 – No, the source is not present

V11 – Scientist/Expert Source

A "Scientist/Expert" source is an identifiable person or group that has technical knowledge or special training. A government agency whose mission is science should be coded as a "Scientist/Expert" source. See the provided examples for assistance.

1 – Yes, the source is present
0 – No, the source is not present

Examples:

Academic	National Interagency Fire Center
Analyst	National Weather Service
Climate Prediction Center	National Oceanic and Atmospheric Administration
Climatologist	Plant operator
Data center	Researcher
Dept. of Fish and Wildlife	Scientist
Dept. of Natural Resources	State Health Official
Dept. of Water Resources	Survey
Economist	Technology Consultant
Environmental Protection Agency	US Drought Monitor
Forest Service Official	US Forest Service
Industry Observer	US Geological Survey
NASA	Weather Forecaster

V12 – Nonprofit/Advocate Source

A "Nonprofit/Advocate" source is an identifiable person or group that publicly supports or recommends a cause or policy, including environmentalists. "Nonprofit/Advocate" sources often include associations, councils, bureaus, and think tanks, including the Association of California Water Agencies, the US Dairy Export Council, and the State Farm Bureau. A general reference to democrats or republicans should also be coded as a "Nonprofit/Advocate" source.

1 – Yes, the source is present
0 – No, the source is not present

V13 – Citizen Source

A "Citizen" source is an identifiable person or group that has no cited technical knowledge, special training, or specified place of employment. Citizen sources are typically identified by their proximity to or direct experience with an issue or condition, instead of by their occupation. Citizen sources are often cited as residents or homeowners. Students are also "Citizen" sources.

1 – Yes, the source is present
0 – No, the source is not present

V14 – Other Source

An "Other" source is an identifiable person or group that cannot be categorized under the abovementioned source variables, including artists, journalists, editors, entrepreneurs, religious spokespersons, tribal spokespersons, lawyers, attorneys, and others. General references to critics, supporters, opponents, proponents should also be coded as "Other." Additionally, content from other newspapers or wire services should be marked as "Other" sources.

1 – Yes, the source is present
0 – No, the source is not present

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