

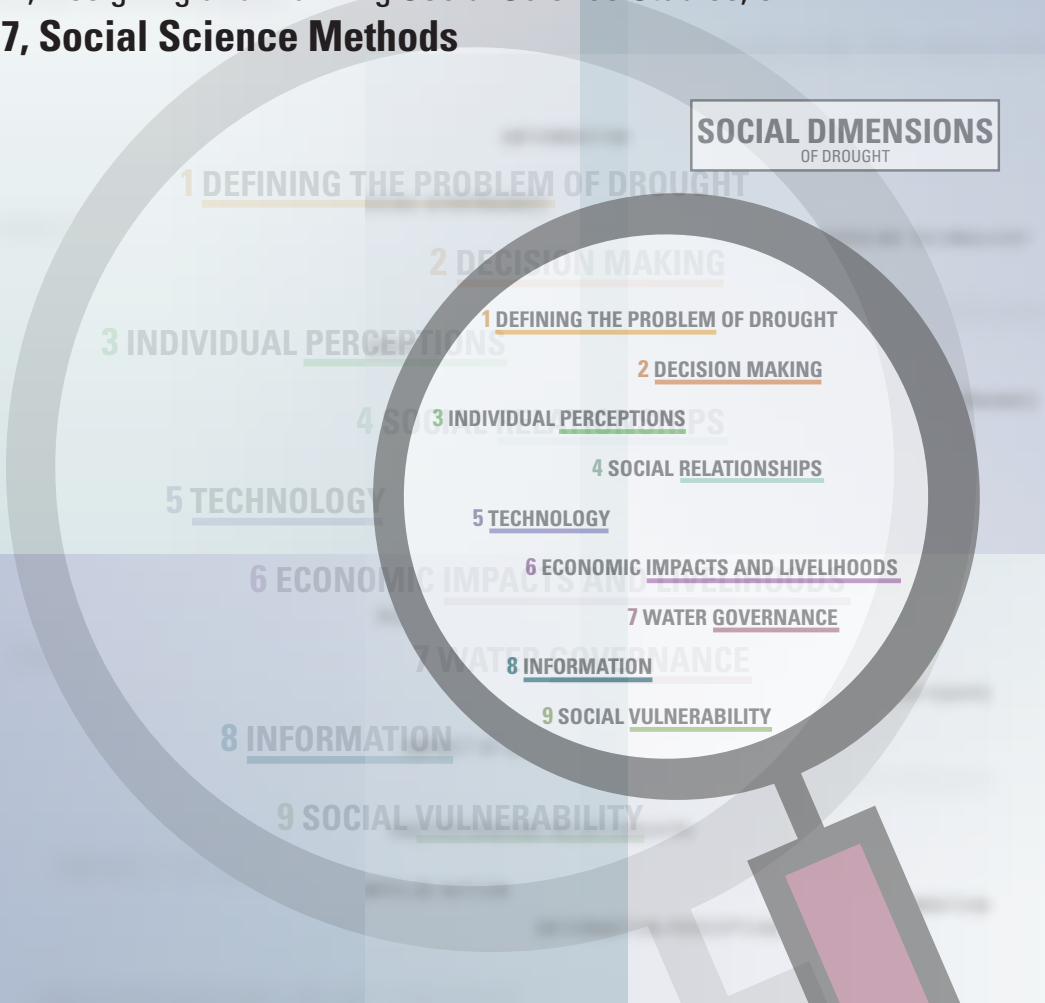
Climate Adaptation Science Centers Program

Rapidly Assessing Social Characteristics of Drought Preparedness and Decision Making: A Guide for Practitioners

Chapter 1 of
Section A, Designing and Planning Social Science Studies, of
Book 17, Social Science Methods

SOCIAL DIMENSIONS
OF DROUGHT

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Techniques and Methods 17-A1

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Rapidly Assessing Social Characteristics of Drought Preparedness and Decision Making: A Guide for Practitioners

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Executive Summary

This guide is intended to provide managers, decision makers, and other practitioners with advice on conducting a rapid assessment of the social dimensions of drought. Findings from a rapid assessment can provide key social context that may aid in decision making, such as when preparing a drought plan, allocating local drought resilience funding, or gathering the support of local agencies and organizations for collective action related to drought mitigation.

Part I—In the introduction to Part I, we describe the unique problems associated with drought—particularly its slow onset and long duration, which make it difficult to define drought—and highlight five major types of drought (see Box 1). We introduce a few social dimensions of drought (such as economic and institutional perspectives), demonstrate how these dimensions can be interrelated, and describe a few of the modern challenges (such as transformational change and cascading risks) that practitioners face.

We also provide background on the rapid assessment method, first describing it as a “snapshot” of the social landscape, then providing some key advantages of the method (it can be quicker and cheaper than more in-depth methods), and lastly describing how secondary data and other methods can help overcome some of the disadvantages of rapid assessments.

Then, after summarizing the process of developing this guide, we outline the process of using the guide. Importantly, we compare the guide to a travel guide, which provides many different types of information and is best approached with specific interests in mind. Ultimately, we hope for this guide to be malleable enough that it can be helpful to researchers and practitioners in many different contexts, using many different research methods. Related to how to use the guide, we characterize the type of person who might be motivated to use this guide. We also specify key qualifications for a researcher conducting a rapid assessment, drawing particular attention to training on ethical considerations (see Box 2).

We sketch out key considerations when choosing social dimensions of drought to focus on, and the type of data used for analysis. First, it is important to note that in this guide we provide nine important social dimensions of drought, but this is by no means a comprehensive list, and a researcher may

find that other dimensions better fit their local context. Second, we provide some pros and cons to a narrow (focusing on just a few dimensions or at a smaller scale) versus broad research focus. Lastly, we describe the pros and cons of using primary versus secondary data (one strategy is to use both, sequentially) and qualitative versus quantitative data.

Ultimately, Part I of this guide functions as an exploration of the various decisions a researcher will make when designing a rapid assessment. These decisions will inform the type of findings and other outcomes that result from the rapid assessment.

Part II—Part II of this guide introduces nine key social dimensions of drought: defining the problem of drought, individual perceptions, social relationships, technology, economics and livelihoods, water governance, decision making, information, and social vulnerability. Each section provides background and key considerations related to a particular dimension, as well as ideas for how to explore the dimension via a rapid assessment.

Part III—Part III of this guide provides two hypothetical examples of how one might use this guide to aid the practitioner in implementing the lessons learned here. In the first example, a watershed group uses two dimensions, defining the problem of drought and social relationships, to inform a community meeting about protecting fisheries from drought. In the second example, a resource manager uses the economics and livelihoods and social vulnerability dimensions to inform the development of a livestock grazing drought management plan.

Part I: The Research Guide

Part I introduces this guide and its objectives and describes what a rapid assessment is. It also describes how to use this guide, including how to find a collaborating researcher, how to choose social dimensions to study, and tradeoffs to consider when designing research.

Box 1. Five Types of Drought

Drought is not a clear-cut phenomenon. Different indicators can be used to measure drought conditions or determine whether a drought is occurring (for example, precipitation, temperature, and snowpack)(Heim, 2002). Generally, experts identify five distinct types of drought (Wilhite and Glantz, 1985; Crausbay and others, 2017). Note that there is overlap between these types of drought; prolonged meteorological drought will eventually lead to impacts on other parts of the system, resulting in the other forms of drought listed below. For example, socioeconomic drought might result from alterations to agricultural crop production (agricultural drought) that affect local livelihoods. The types of drought are:

1. Meteorological drought

This is what many laypeople think of when describing drought: a change in meteorological conditions. Broadly, it is measured by the amount of precipitation, or amount of time since the last precipitation (Wilhite and Glantz, 1985). Note that the amount of precipitation (or lack thereof) associated with a meteorological drought varies by location, since the level of “normal” precipitation is different in different places.

2. Hydrological drought

This type of drought focuses on surface water, such as streamflow or reservoir levels, and subsurface water, such as underground aquifer levels (Wilhite and Glantz, 1985).

3. Agricultural drought

This type of drought focuses on the impacts of lack of water on crops. It often focuses on the availability of water in the soil, rather than on precipitation (Wilhite and others, 2014). Note that different crops, and crops at different stages of life, require different levels of water, and determining agricultural drought is a function of those factors as well as water availability (Wilhite and Glantz, 1985).

4. Socioeconomic drought

This type of drought focuses on human needs, and frequently on how a lack of water disrupts supply and demand (Wilhite and Glantz, 1985).

5. Ecological drought

This type of drought represents more recent research (Crausbay and others, 2017). It focuses less on human drought impacts, and more on impacts to ecosystems.

It is important to recognize that people may experience these different types of drought in overlapping and diverging ways (Kohl and Knox, 2016; Cravens and others, 2021b). In using this guide, you may find it helpful to think about which type of drought you or other stakeholders are most concerned about, and in some cases, focus your research on one or more specific types.

Introduction and Project Objectives

Drought is a complex environmental hazard that impacts both ecological and social systems. Drought is unique from other hazards because of its slow onset and long duration, which often make it difficult to pinpoint exactly when a drought started or even to gain larger agreement about if a drought is occurring (Wilhite and Vanyarkho, 2000). In fact, conditions in the same time and place can lead some experts to declare conditions a drought and others to not. This results both from multiple ways of defining drought (Box 1) as well as from the wide range of metrics and indices which measure drought differently (Heim,

2002; Svoboda and Fuchs, 2016). Most broadly, drought can be defined as, “insufficient water to meet needs” (Redmond, 2002), but what constitutes insufficient water will differ for each type of drought (Box 1). In addition to the difficulty of defining drought, identifying its consequences can also be challenging. Unlike other disasters, drought does not always involve immediate loss of life, injury, or destruction of property (though these are certainly possible, particularly with severe droughts); however, given their long duration, droughts can have deep, long-lasting impacts on communities and ecosystems, both directly and indirectly (Dow, 2010). As a result, some of the largest consequences and challenges drought carries are social.

Introduction to the Social Dimensions of Drought

The social dimensions of drought are broad and diverse, addressing impacts that drought has on human communities as well decisions about how to prepare for and respond to drought from a range of economic, institutional, political, socio-cultural, and psychological perspectives (Kallis, 2008; McNeeley, 2014; Kohl and Knox, 2016; Van Loon and others, 2016; Greene, 2021). From an economic perspective, drought can have substantial impacts on industries such as agriculture, forestry, and energy production (Wilhite and Vanyarkho, 2000). Drought outcomes are influenced by interaction with institutional factors, such as water laws determining who has rights to water (Cantor, 2016). Drought can also lead to difficult power dynamics and justice issues, regarding who has access to water and how water is used, among other issues (Becker, 2021). A socio-cultural and (or) psychological perspective can be helpful when trying to understand community or individual reactions to the impact of drought on familiar landscapes or ways of life (Vins and others, 2015). These are just a few examples, among many, of how social dimensions both shape and are influenced by drought.

The social dimensions are also interrelated. For example, an examination of drought that focuses on economic impacts might highlight how long-term water shortages may cause a farmer to switch crops or take out a loan to withstand a bad harvest, among many other adaptation options (Smit and Skinner, 2002). To understand the choice a farmer makes, it may be helpful to also examine the institutional and political forces at play, such as agricultural loan or crop insurance availability (McLeman and others, 2008; Kachergis and others, 2014) and the water infrastructure and drought planning in place to manage changing conditions (Smit and Skinner, 2002; see resources from the National Drought Mitigation Center: <https://drought.unl.edu/Planning/PlanningProcesses.aspx>). A socio-cultural perspective may also shed light on access to agricultural loans; for example, research has documented Black farmers' historic lack of access to agricultural loans, including disaster relief loans, that can help farmers supplement their diminished income from declined crop production (Hinson and Robinson, 2008; Cowan and Feder, 2011; Daniel, 2013).

Drought can also carry significant challenges for practitioners who are entrusted with making sound and sustainable decisions. The impact of their decisions, as well as the decisions of other stakeholders, and questions of who is involved in making decisions, are also important topics within the social dimensions of drought literature. In addition to many other considerations, an emerging challenge for practitioners today is the potential for drought to trigger or play a role in transformational change of ecological conditions (for example, changes to vegetation composition or species ranges; see Crausbay and others, 2022), thus necessitating novel approaches to managing resources. This is particularly challenging for resource-dependent communities (Knapp and others, 2020). Another big challenge is the interconnectedness of disasters, sometimes referred to as cascading risk or hazard

(Cutter, 2018, 2021). For example, drought can increase the risk of wildfire (Wall and Brown, 2015). Wildfire, in turn, can impact the natural environment, nearby communities, and perhaps even communities further away, affected by wildfire smoke (Liu and others, 2015; Black and others, 2017). Both wildfires (Westerling and others, 2006) and drought (Seager and others, 2007; Trenberth and others, 2014; Cook and others, 2016) are expected to be increasingly frequent and severe in many regions due to climate change. Transformational change, cascading risks, and climate change can destabilize the foundational assumptions underlying drought preparedness and response and are characteristic elements of modern environmental decision making, often demanding that practitioners rethink previous management strategies.

Motivation and Aims

This project aims to present an adaptable and efficient approach for studying the social dimensions of drought to inform decision making about drought preparedness and response. Instead of presenting a structured, formal method, it offers a flexible guide for designing and implementing rapid assessment of the social dimensions of drought across contexts and geographies. We see this working as a guidebook, helping to prepare and inform practitioners and researchers about potential avenues, tradeoffs, and approaches to designing a rapid assessment that probes the social dimensions of drought. This guide will offer much of the pre-study leg work so that practitioners with little knowledge of social science and researchers unfamiliar with social science literature of drought can quickly get caught up and plan their study.

In this guidebook we refer to three main actors: the practitioner, the researcher, and the research team. We refer to the “practitioner” as anyone who makes decisions about drought preparedness or response. This may include Federal, State, or county natural resource managers (for example, the U.S. Department of Agriculture Forest Service [FS]), a water manager (for example, water conservation district), a local watershed group or nonprofit (for example, a local water conservancy), or others. When this guidebook refers to the “researcher,” we are referring to someone the manager has brought in to help design the project, collect and analyze the data, and report the findings (see “Finding a Researcher”). While there are some cases where a practitioner may have the skills to conduct their own research, in most cases they will likely need to partner with a social scientist. References to the “research team” are meant to include both the researcher and the practitioner. However, in cases where the practitioner has the needed social science training and is conducting the research, all three of these different roles will be filled by the practitioner.

A rapid assessment can provide a “snapshot” of the social landscape in the moment it is conducted, identifying key features such as major actors, social perspectives, challenges, and potential avenues for solutions. While a “snapshot” may not provide the fine-grained details or depth of an extensive field

study, it can still be helpful when making decisions, especially in time-pressured situations, when limited funding is available, or when the goal is to provide background information or context (for example, to add richness to a study focused on ecological objectives). Since rapid assessments can be designed and conducted quickly, they are less expensive, and thus may not require practitioners to seek external funding or large grants that require significant time to develop, which can also slow the research process. Further, since drought is not static, rapid assessments are helpful because they offer practitioners the flexibility to take multiple “snapshots” at different points of a drought or repeat the “snapshot” across different geographies. However, we note that rapid assessments should be seen as a complement to formal social science research that will be appropriate in certain situations and not in others, rather than a replacement for in-depth empirical studies.

Practitioners often have a rich and nuanced mental model, or general idea about how the hydrological and (or) ecological system they manage works, based on monitoring data, formal training, and place-based experience in the field (Clifford and Travis, 2018). Yet, in many cases they lack a similar model for the social system they work within, leaving their understanding somewhat lopsided or unbalanced. A rapid assessment “snapshot” can help balance this understanding so that decisions are being made with a more complete and broad understanding of the entire system (including its social as well as ecological or hydrological dimensions). Another way to think about a “snapshot” is that doing this type of rapid assessment can be like offering the practitioner a mirror. It does not change the underlying system, but rather reflects current issues and dimensions and helps practitioners see the whole picture more clearly. A “snapshot” can be helpful when practitioners decide which strategies deserve consideration for drought management and in weighing tradeoffs and selecting a strategy to implement. Integrating a “snapshot” of the social system might help predict unintended consequences (for example negative economic impacts to the local community, conflict between stakeholders) or aid in identifying especially vulnerable communities that might be disproportionately impacted by a management decision. It may also help identify strategies that have broad support and lead to favorable outcomes. Either way, practitioners lacking this social understanding may be at a disadvantage when preparing for and responding to drought.

Through this project, we investigated what a rapid social assessment method would look like in the context of drought, how it can be applied, and how it can contribute to drought preparedness and response. To do so, we leveraged existing rapid assessment methods. The project has two main goals: (1) to review existing rapid evaluation and assessment methods from other fields (for example, health, disaster preparedness, resource management) to synthesize findings and inform a drought rapid assessment and (2) to develop a guidebook to support the development of a drought rapid assessment study.

Background on Rapid Assessment

Rapid assessment poses a time-efficient and economical alternative to traditional research methods. This section pulls from the scientific literature to describe what a rapid assessment is, including the strengths and weaknesses of the method.

Defining Rapid Assessment

Rapid assessment can be broadly defined as “research approaches [that] aim to be cost-effective, timely, and inductively informed by a range of qualitative and quantitative methods to optimize validity” (Fitch and others, 2000, p. 64). These assessments are generally characterized by iterative data collection and analysis, data triangulation, and intensive teamwork (Beebe, 2004). Although researchers differ in their definition of “rapid,” the standard timeframe for a rapid assessment varies between a few days and a few months. Self-identified rapid approaches have been carried out in as little time as a single day (Fennessy and others, 2007) or have lasted as long as six months (Tambe and others, 2011).

The rapid assessment approach has been used by social science researchers from a broad range of disciplinary backgrounds to study the social dimensions of different environmental systems (see appendix 1 for more history on the development rapid assessment methods). Rapid assessments are often employed during health and disaster emergencies when fast data collection and analysis is required to inform critical decisions, such as the division of resources or determining triage and intervention schedules (Spence and others, 1999; Ervin, 2003). Despite different goals, one of the main objectives and a defining element of rapid assessment approaches is a focus on producing actionable information to inform decisions in critical moments (McNall and Foster-Fishman, 2007; Oakes and others, 2021).

Designing Rapid Assessments

Rapid assessments are tailored to individual contexts and according to different timescales, different practitioner proficiencies, and different data-specific needs. This guidebook offers research insight, direction, and materials based on a review of 26 different rapid assessment methodologies (see [table 2.1](#) in appendix 2 for a summary of these methodologies).

Many researchers are quick to note that rapid assessments, by their nature, necessitate rapid data collection and prompt action. The urgency of data collection often dictates whether or not a rapid assessment is undertaken (McNall and Foster-Fishman, 2007; Pink and Morgan, 2013). Proponents argue that rapid assessments are not merely a substitution for traditional methods; they offer a complimentary assessment building on prior, in-depth research and should be viewed as a viable option when data are urgently needed (Fitch and others, 2000; McNall and Foster-Fishman, 2007), such as

when adapting to rapidly changing climatic conditions (Oakes and others, 2021). Importantly, one of the reasons that rapid assessments can be so time efficient is that they can build on the long, in-depth work of other researchers that provide a starting place and foundation. This view of rapid assessments as complementary not substitutable underlies this effort to develop a guide for rapidly assessing social dimensions of drought. A rapid assessment may collect enough information to offer a “snapshot” of the community or fill in a critical gap in understanding before a key decision is made. Another possible outcome of a rapid assessment is identifying an important research need for in-depth analysis. Identifying an important gap in knowledge or an information need is a valid and salient research finding that can contribute to improved drought decision making.

One common critique of rapid assessments is that they require making a tradeoff between speed and data richness or quality (Harris and others, 1997). However, some researchers combat the notion that rapid methods sacrifice reliability at the expense of a shorter assessment, particularly in cases when researchers triangulate their data with additional sources (for example, Garces and others, 2010; Atuyambe and others, 2011). For example, data on the economic impacts of drought collected via rapid assessment might be triangulated with data on the cost of economic outputs and unemployment data (see “Data Considerations” for a larger discussion about integrating different types of data).

Scholars of social science methods also suggest other ways that researchers can validate rapid assessment findings. These same methods are used to validate the findings from traditional, extended research. McNall and Foster-Fishman (2007) advise other rapid assessment practitioners to adopt a set of adequacy criteria, confirming that the data meet standards such as credibility (for example, accuracy of portrayal of respondents’ statements). They echo Guba and Lincoln’s (1989) call for confirmatory and dependability processes to bolster trustworthiness. Similarly, Garces and others (2010) include community validation as part of their four-step Rapid Appraisal of Fisheries Management System framework. Ground truthing is also commonly used to confirm rapid assessment results, typically through participatory efforts, field observations, or additional targeted data collection (Smith and others, 2003; Tambe and others, 2011).

A Guide for the Rapid Assessment of the Social Dimensions of Drought

This section of the guide describes how the guide was developed, as well as who might use it and how to use it. This section also provides suggestions for how to find an appropriate researcher to conduct a rapid assessment, how to select which social dimensions of drought to study, and tradeoffs to consider when deciding what type of data to collect.

Development of the Guide

This research guide was developed based on a synthesis of theories, empirical studies, other research syntheses and author expertise about drought and environmental management with a social science lens. It aims to present important themes, methods, approaches, and topics to guide rapid analysis of the social dimensions of drought. This synthesis helped identify the overarching themes of the social dimensions of drought to offer a foundation for researchers new to the topic. Specifically, this guide drew on three key sources to inform its development: 1) existing drought and water decision typologies, 2) broad review of social science of drought scholarship, and 3) literature review of rapid assessment methods. Together, these three sources of data allowed us to synthesize numerous case studies and research approaches to present a compilation here.

Typologies about water use (Arnell and Delaney, 2006; Engle, 2012), climate adaptation (Smit and Skinner, 2002; Moser and Ekstrom, 2010; Eisenack and Stecker, 2012), environmental management (Ostrom, 2008, 2010; Huntjens and others, 2012; Hinkel and others, 2015), and drought (Keshavarz and Karami, 2014; Beeton and McNeeley, 2020; Cravens and others, 2021a) were a key data source for the development of this guide—and the social dimensions of drought selected—because they are developed to apply across a single context and often are themselves based on consideration of numerous empirical cases. They were helpful in identifying dominant and recurring themes critical to drought preparedness and response and developing important dimensions to include. Thus, we used the typologies to direct the early structure of this guide and then looked to individual studies, methods, approaches, and datasets to develop each social dimension of drought in depth. This approach of building upon typologies—which are themselves synthetic and intended to guide other inquiries—gave us a robust foundation for this guide and ensured that our dimensions reflected the themes most important in the growing literature around the social science of drought. Of course, context will determine which social dimensions are most important, so while typologies were used to attempt to cover the most important ones reported in the literature, this guide is will not be exhaustive, but rather covers the dimensions most commonly documented.

One typology that both inspired and significantly informed this guide was the outcome of the 2018 Drought Social Science Synthesis workshop sponsored by the Department of the Interior North Central and National Climate Adaptation Science Centers (Cravens and others, 2021a). A range of government and university drought social science researchers participated in the workshop, together developing a typology of drought decision making, as well as a lexicon and analytical framework to use when thinking about drought from a social-ecological perspective in the western United States.

A second key source of inspiration that informed our selection of the social dimensions of drought was the broad, interdisciplinary, and growing literature on social and institutional aspects of drought. As described in the introduction, drought is a diverse phenomenon whose impacts vary across scale and geography. Social scientists have demonstrated that perceptions of impacts also vary across individuals, communities, and economic sectors (Taylor and others, 1988; Woudenberg and others, 2008; Goldman and others, 2016; Kohl and Knox, 2016). Relatedly, other research has examined the assumptions that shape individuals' climate perceptions (for example, Clifford and Travis, 2018) and the impacts of those perceptions on topics such as drought management actions (for example, McNeeley, 2014; Kohl and Knox, 2016; Cravens and others, 2021b).

Finally, this guide was informed by various approaches to rapid assessment study design. Specifically, we reviewed 26 different rapid assessment methodologies to inform the development of this guide and help researchers navigate difficult study design questions. Rapid assessment case studies were initially selected using a keyword search (for example, “rapid assessment,” “climate change vulnerability assessment,” and “rapid analysis”). Additional articles were identified by consulting the citations referenced in the first batch of case studies. This literature especially informed our discussion of data considerations in rapid assessment studies and their respective tradeoffs (see “Data Considerations” below). Most of the rapid assessments reviewed were focused on hazards, disasters, or environmental issues like climate change, which all relate to drought, but do not explicitly engage drought or its social dimensions.

One method that has been used to explore the different consequences and intervention points for drought is the Vulnerability Consequences and Adaptation Planning Scenarios (VCAPS) (Kettle and others, 2014; Webler and others, 2016; Tuler and others, 2020). VCAPS is a process that convenes stakeholders to focus on a climate hazard—including drought (Arens and others, 2018; Clifford and others, 2018; Ehret and others, 2018)—and specifically focuses on the social dimensions and the local consequences. Researchers conduct interviews with local participants and lead a workshop where the community collectively maps out multiple “chains of consequences” for different drought impacts, specifically focusing on why drought impacts matter for their community and on the human consequences, which then can be used to

identify intervention points and design strategies. VCAPS can be an excellent scoping tool for determining what elements are important or learning about potential consequences, but it often is focused on specific concerns (like those we describe in “Social Dimensions of Drought”), and the consequences explored are dependent on the people in the workshop, thus offering insight into certain perspectives over others. We used insights from this method to inform the guidebook development, but rather than describe a specific method, we offer broader research guidance that could be adapted to explore a range of research questions. That said, VCAPS is a process that some research teams may want to incorporate into their rapid assessment because it can harness local knowledge to understand risks associated with drought locally and help identify key strategies to respond.

This guide was originally designed to be tested with two concurrent and iterative case studies. We planned and scoped out projects with two partners (one in Colorado and one in Oregon). However, we were unable to do the fieldwork and testing of the guide through case study work because of the COVID-19 pandemic and catastrophic wildfires directly affecting the communities we were engaging in the periods of June 2020 through October 2020. In an effort to nonetheless make the findings of this project publicly available in a timely matter, we are publishing this guide based on previous studies and literature review. We invite colleagues to help us test and refine the methods and social dimensions of drought described in this guide to improve its use in a broad range of contexts.

Who Should Use This Guide

This guide was written for the practitioner, manager, or decision maker who is interested in better understanding the social dimensions of drought, in order to inform decisions about drought management, preparedness, response, and wider questions of resilience. They may be approaching a key decision—such as developing a drought plan, starting a planning process for a watershed, conducting an environmental impact assessment, and so on—that they know will affect people in their community and they want to better integrate community needs into their decision. This practitioner may have already experienced how prior decisions about water management and drought leads to conflict or unintended consequences and may want to

Developing a drought plan:

If practitioners want to use this guide to support a drought plan, they may benefit from also using the National Drought Mitigation Center Drought-Ready Communities guide, which offers step-by-step directions of how to develop the plan, including an information gathering phase in which this rapid assessment would fit well. This goal of developing a plan will also shape your rapid assessment and which dimensions may be most useful.

More information can be found at:

https://drought.unl.edu/archive/Documents/NDMC/Planning/DRC_Guide.pdf

decrease the chances of that happening again. They also may recognize that despite access to abundant ecological, hydrological, or biophysical data that give them a decent understanding of the physical environment that they work within, they still have significant uncertainty because of the social dimensions and systems at play. In that case, implementing this approach may help to balance their understanding and offer them a better “snapshot” of the entire system.

How to Use This Guide

This document was developed to serve as a research guide for rapidly studying the social dimensions of drought. This research guide aims to help practitioners and researchers design a study quickly and with minimal background knowledge required about the social dimensions of drought. We have developed materials around key themes synthesized from the literature (see “Development of the Guide”) which will likely be relevant to studies across various contexts. Our hope is that we have provided a map forward and clearly articulated many of the speedbumps and obstacles so that they can be anticipated and more efficiently navigated. For an overview of the research process, as well as information on which sections of this guide can help at each stage of the process, see [figure 1](#).

Guide is the operative word here; this was not developed as a detailed method but instead a guiding resource to inform and support the development of a rapid assessment in a particular location. Rather than a strict method that would examine a specific question, we offer flexible approaches that are adaptable to different contexts. This flexibility means that the guide is not a set method that can just be picked up and implemented, but instead will require important decisions to be made by the researcher and project team. This malleability, while requiring more input from the researcher, also means that it will be more applicable across sites with different social dimensions arising from drought.

In many ways, this guide can be thought of as similar to a travel guide that someone may pick up before visiting a new place. A travel guide tells the reader about the history of the place, summarizes important background information and context, and makes recommendations on where to eat and which sites are worth visiting. A travel guide also recommends times of year that might be best to visit a place and offers sample itineraries. The guide does not fully plan the trip; rather, it provides the information necessary for swift, informed, and efficient trip planning, allowing the traveler to decide what is most important or appealing as they navigate their own journey.

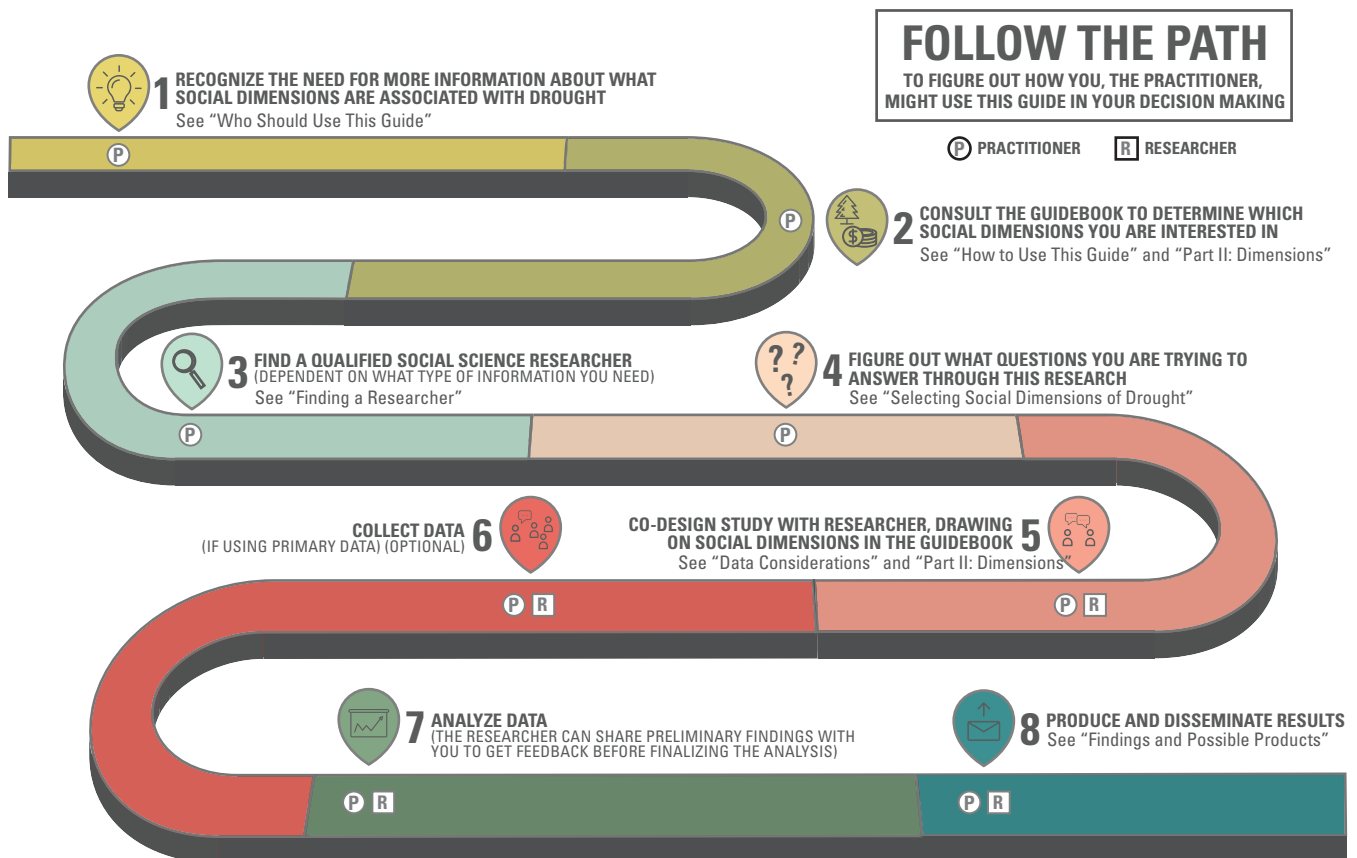


Figure 1. Conceptual map of the research process and how to use this guide.

This is analogous to how this research guide can aid a researcher or project team aiming to study the social dimensions of drought. Like a traveler with specific wants and needs, a researcher knows that any study on the social dimensions of drought needs to be tailored to the specific context of place and the specific needs of the decision-maker or practitioner and local community to be useful. Like an architecture enthusiast who uses a travel guide to find and learn about interesting buildings in the place they visit, the researcher can bring their needs to their perusal of this guide, which can point them toward related questions or ideas. It is up to the researcher and practitioner to determine which elements of drought are most important in their context and determine how to customize the material in the guide. Thus, the guide provides a foundation upon which the study can be more efficiently designed.

In some cases, researchers will be able to use datasets and sample interview questions for the bulk of the research design, tweaking questions to best illuminate unique contextual elements or adding local datasets to the national datasets this guide suggests for secondary data analysis. In other cases, this guide may be helpful inspiration for thinking about drought locally; in that case, the key social dimensions of drought we highlight might provoke critical thinking and illuminate additional or different issues important to a practitioner. To further elaborate this second case, this guide might inform the overall approach, inspire rapid assessment, and provide the leg work so that researchers can immediately begin the research design phase, but might not provide a significant amount of the research objectives or interview questions. In fact, researchers and practitioners may decide to pursue alternative focuses. Either way, the guide works to provide a foundation for the research to quickly assess and understand the field and make informed decisions for their research design.

Finding a Researcher

Rapid assessments generally require practitioners skilled in the relevant data collection methods, especially when conducting direct research with people. The condensed—and sometimes urgent—nature of rapid assessments allows little time for formal instruction, “learning by doing,” or iterative learning. These conditions have predisposed some scholars to include only experienced researchers among their team (McNall and Foster-Fishman, 2007). Mueller and others attribute the success of their rapid participatory rural appraisal of traditional ecological knowledge to their “well trained team, the lack of which may keep conservation biologists from applying these methods” (Mueller and others, 2010, p. 148).

The type of rapid assessment described in this guide will likely require research skills beyond those possessed by the average practitioner and thus require leveraging agency or organizational resources, developing community partnerships, or bringing in experts to join the team. A practitioner interested in this type of study might partner with a graduate student from a local university or hire a researcher to conduct the

study. Any research project that collects new data will likely require a trained social scientist, especially if using interview or survey methods. Empirical social scientists receive important training on the ethical considerations of their work and have been taught how to reduce any possible risks to study participants (Creswell and Creswell, 2017). For example, one important consideration is confidentiality, which is a concern when data are easily linked to individual people (see Box 2).

If the practitioner thinks that they want a certain type of research approach, it will be helpful to look for a social scientist with that background. For example, economic valuation or modeling generally will require an economist, whereas a survey may require a social scientist with quantitative analysis and survey design experience. Some rapid assessments can be conducted by less experienced researchers if they are supervised by a knowledgeable researcher who can advise throughout the research design process. For example, hiring a local student who is supervised by their professor may be an affordable (or potentially free) way to bring a social scientist onto the team. In this case, the professor would ensure that the student followed best practices in social science—particularly around ethics and confidentiality (see Box 2)—and used robust analytical tools to ensure dependable findings. Practitioners may also benefit from intentionally choosing a researcher with experience engaging with practitioners or working with the public, an approach to research called coproduction (Meadow and others, 2015; Beier and others, 2017), which is focused on producing results that are tailored to decision makers and that will have societal impacts (Meadow and Owen, 2021).

Selecting Social Dimensions of Drought

One of the most important decisions that the researcher and practitioner will need to make is which social dimensions of drought are most important in their context and what information will be most helpful for decision making. We envision that this guidebook may make the research design phase easier and quicker, as researchers can pick from an assortment of relevant social dimensions of drought to explore in their particular site. This guide offers nine social dimensions of drought, but we note this is not an exhaustive list of all possible dimensions. Instead, they represent themes and issues that have been well documented in the literature and (or) identified as variables in typologies (see “Development of the Guide”). Thus, it will fall to the research team to determine any gaps.

We suggest the research team spend time thinking about which social dimensions are most important to support drought decision making in their context. Before selecting which dimensions to explore, the practitioner and researcher should go to “Part II: Social Dimensions” and read through each social dimension description that explains what it covers and how it might be useful, as well as the sample questions offered at the end of each dimension. After the team reviews the nine dimensions, they should discuss and eliminate any dimension that does not seem relevant or useful to their context. Similarly, they

Box 2. Ethical Considerations.

History of Ethical Research Practices

Any time scientists work with people (human subjects), it is important to pay extra attention to ethical considerations. Ethical research considerations rose to the forefront of research design in reaction to a history of ethically questionable experiments, such as Nazi medical experiments during World War II and the Tuskegee Syphilis Study (Bankert and Amdur, 2006). Today, researchers ensure that they are adequately protecting their research subjects by going through processes like institutional review board (IRB) approval. This involves submitting a description of the planned research methods for a study to a university, agency, or independent for-profit IRB. The board will evaluate key ethical considerations, such as confidentiality, level of risk, benefits to participants, and consent.

Why is Confidentiality So Important for This Type of Work?

Confidentiality is an important ethical consideration for social science research. During surveys or interview studies, participants may choose to share information that is confidential, and if they are identifiable in published research results or even in casual conversations, they may face repercussions for sharing that information with a researcher. For example, an employee who shares examples of their employer's bad business practices could be fired if their employer can identify that employee based on the findings. Other data, such as income or health history, are generally considered to be personal and private, and may be protected by law. Regardless of the information gathered, it is important to plan how to ensure participants are adequately protected and clearly communicate to participants the level of confidentiality they can expect when participating in the study.

The bottom line is: When doing research with human subjects, researchers must make sure they have seriously considered how to do no harm to participants, and especially how data might be used or identified.

Beyond Minimum Ethical Requirements

The IRB is a critical step for researchers to take to ensure they meet ethical standards. However, there are other ethical considerations beyond the IRB. It is important to consider the broader ethics of the project, particularly the research team's relationships with partners, community members, and stakeholders. Wilmer and others (2021) offer expanded ethical principles for social science researchers working with partners to consider when conducting research; they include "(1) appropriate representation, (2) self-determination, (3) reciprocity, and (4) deference" (p. 453).

While it can sometimes seem as though all stakeholder engagement is a good idea, that is not always the case. Best practices indicate that the research team should consider the costs and benefits to those who participated in their research, which may lead teams to intentionally select different levels of engagement that are appropriate for the project and fair to the participants (Banzai-Dodson and others, 2021). Collecting primary data through interviews or surveys requires participants to volunteer their time to support the study, and that engagement usually sets the expectation that their preferences, concerns, and local knowledge will be used in a meaningful way (Wilmer and others, 2021). The research team should keep this in mind and not collect data that they do not expect to use. Research that meaningfully engages participants can be identified by the fact that participant responses impact the decision being made (Arnstein, 1969).

The bottom line is that the research team needs to consider broader ethical principles when developing the study and choosing how engaged they will ask community members to be, recognizing they are implicitly committing to consider what they find in the study in a meaningful way.

If you are curious about the IRB approval process, you can learn more through IRB certification organizations such as CITI (<https://about.citiprogram.org/en/get-to-know-citi-program/>), or through many university websites.

should also discuss if their need falls outside the nine dimensions listed, which may require them to develop an additional dimension by exploring the literature more in depth.

If the team is still unsure about which dimensions to select, this may indicate they need to explore drought more broadly, and we would recommend choosing "Dimension 1: Defining the Problem of Drought" to help the team understand what types of issues drought represents in their

community. Additionally, an unsure research team may want to have informal conversations with colleagues or community members and ask them about what type of social issues they associate with drought. Once the team has an idea of which dimensions they want to select, they should think about what data or research findings they could end up with from that focus and evaluate how helpful that data would be in changing or influencing a decision; intriguing research focuses

motivated by curiosity can sometimes leave researchers with “interesting” data that is not relevant to an important decision they have to make and thus not very useful or usable (Wall and others, 2017). The selection process may take some time and iteration between the practitioner and researcher (see Dilling and others [2018] for strategies for how to develop usable science with partners). It is important that the practitioner and researcher take the time early on to ensure that they focus on relevant and useful social dimensions that will support local decisions or needs.

When designing the project, teams may find it helpful to consider the research design tradeoffs shown in [table 1](#).

Data Considerations

When designing the project, the research team will need to make important decisions about the data on which they will rely. This section describes the strengths and weaknesses of using primary versus secondary data, as well as qualitative versus quantitative data.

Primary versus Secondary Data

The research team will need to decide if or how much of their own data, also called primary data, they want to collect, and how much they want to rely on data that already exist, also called secondary data. Secondary data refers to data collected previously by another researcher or entity, often with a different research purpose (Creswell and Creswell, 2017).

There are benefits and costs to both types of data. Primary data are beneficial because their collection can be tailored to the specific interests of the research team (place, scale, demographics, and so forth), yet collecting this type of data is often more resource intensive, both in terms of time and financial costs. Secondary data are often free and easily available but carry the limitations of the original data collection methods. For example, secondary data may only provide information at the county or State scale, which is less helpful for learning about the watershed scale. Or, secondary data may not tell you about the demographic characteristics that you are most interested in (respondents’ gender, income, race, and so forth).

A research team also has the option to use both kinds of data in the study. Each dimension may lend itself to a different type of data; some have little available secondary data, while others have plenty. For example, it would likely be hard to understand social relationships (“Dimension 3: Individual Perceptions”) and trust based on secondary data unless serendipitously a previous social science project had already focused on that topic locally. Economic Impacts and Livelihoods (“Dimension 6”), on the other hand, will likely have a lot of secondary data, but those data may or may not answer the specific questions of the research team.

Another strategy for using both primary and secondary data together is to use them in phases. Secondary data are often broader or at a bigger scale than data collected using qualitative methods, and this might make those data very helpful in an initial phase to use as background data or to get an overview of a topic that will help you determine where to focus your data collection. Larger datasets can be used to identify important variables or community-scale dynamics to explore, populations to study, or locations to focus on in a rapid assessment. Some datasets will readily provide this information; others will require further quantitative analysis. For example, datasets about social vulnerability (“Dimension 9”) will combine different demographic data (for example, gender, age, race) with socioeconomic data (for example, income, education level) to estimate vulnerability. While this information will be coarse, it may help the team discover new populations on which to focus the second phase, their primary data collection, such as on a large immigrant population, a population of people with disabilities, or a neighborhood that has a high expected vulnerability. In this way, initial use of secondary data can help focus and direct in-depth data collection to the most important places in the second phase of the research project. Rapid assessments may especially benefit from a two-phase approach because of the limited time for multiple methods and comparing findings.

Qualitative versus Quantitative Data

The next data question the team needs to consider if they are using primary data is whether to collect qualitative or quantitative data. The decision needs to be guided by the type of questions they want to ask, the resources available for

Table 1. Comparing narrow and broad project scopes.

Scope Level	Pros	Cons
Narrow scope	<ul style="list-style-type: none"> • Can provide specific information • Can address an issue the team has faced in the past, or an issue they suspect they will face in the future 	<ul style="list-style-type: none"> • May miss important factors, especially issues the team is not aware of • May limit discovery of new social dimensions that factor into drought decisions
Broad scope	<ul style="list-style-type: none"> • Can provide a broad sense for social issues in a community • Can lead to discovery of the importance of social dimensions not previously considered 	<ul style="list-style-type: none"> • May not provide specific enough information

data collection, and the analytical skillsets of the researcher on the project. Qualitative data are better at answering questions about how a process works (for example, “how do communities understand the risks of drought?”) or why people behave in certain ways (for example, “why do people choose to enroll in a program to save water by taking out lawns?”), while quantitative data are better at answering questions about what is happening (for example, “what are the impacts of drought?”) or questions of quantity (for example, how much does drought cost the agricultural sector?” See Khagram and others [2010]).

Because rapid assessments have historically drawn on participatory, ethnographic methods, researchers often anchor their projects with a qualitative approach. Indeed, rapid assessment has been characterized as a “qualitative inquiry... to quickly develop a preliminary understanding of a situation from the insider’s perspective” (Beebe, 2004, p. 1). Two examples of practical qualitative applications are Hjortsø and others’ (2005) qualitative research interviews and cognitive mapping to understand stakeholder perceptions about protected areas and van Aalst and others’ (2008) risk mapping and vulnerability and capacity assessment. Other common qualitative methods used in rapid assessments include key informant interviews, focus groups, and observation.

However, other rapid assessment studies rely exclusively on quantitative methods. These methods include surveys, empirical modeling, and analyzing existing datasets. Some studies (for example, Kienast and others, 1998; Zhou and others, 2009) utilize empirical data to model the effects of climate change, or to estimate biological sustainability. Other researchers, like Krishnamurthy and others (2014), construct aggregated numerical scores, or quantitative indices, to measure a particular issue or phenomenon, like hunger or vulnerability.

Ultimately this is a decision up to the research team. The research goals need to match both the available project resources and the skillset of the researcher. Budget will be an important factor to consider. In most cases, collecting primary data will be more expensive than secondary data (unless the secondary data need to be purchased) because of the labor costs of collecting data. With survey data, for example, it may be hard (expensive and time intensive) to get a generalizable sample or collect a sample that provides a community-scale view, though online surveys can be cost effective if the sample population is known (for example, members of a volunteer watershed group). Similarly, interview data—collected following a qualitative method—will require a smaller sample size, but each conversation will be time intensive for the researcher.

Like with any study that collects empirical data, State and Federal managers will want to familiarize themselves with any applicable rules about the type of data they are collecting. One common law that influences how data about people can be collected by Federal employees is the Paperwork Reduction Act (<http://pra.digital.gov>), which governs how Federal agencies collect information from the public. University researchers (and some agency employees) will generally be required to get approval from an Institutional

Review Board (IRB; see Box 2). Agencies may also have their own specific procedures (for example, requirements for approval to survey or interview employees).

Findings and Possible Products

Research findings from a rapid assessment project may illuminate different social dimensions of drought locally and support practitioner decision making about drought. As long as the research team carefully considers the information they need and how that information will support management in the design of the study, the findings should be tailored to their specific decision context. The objective of this type of research is to help practitioners make important and often difficult decisions about how best to prepare for and respond to drought, though results might also lead to new scientific insights as well. For examples of how rapid assessment research findings can inform natural resource management decision making, see “Part III: Using the Guide.”

Findings will support drought management decisions in many ways since each study design will differ based on the specific social dimensions and management focus. Findings may be useful because they confirm previously held assumptions or hunches held by practitioners or illuminate new dimensions not already known or considered. In some cases, findings may be useful in identifying places or populations that are especially important or vulnerable so that this information could help allocate limited resources to where they will make the greatest difference. Similarly, identifying gaps in information or understanding may help the project and (or) research team prioritize future research projects to resolve information needs. In other cases, findings that document various perspectives and beliefs about an issue may not only inform practitioners about the level of agreement or disagreement but may be harnessed to build consensus. For example, documenting different ways that stakeholders understand the problem of drought may be important for identifying divergences, but also shows where there is agreement that may allow unlikely stakeholders to agree on elements of future action.

The outcomes of study designs based on this guide can lead to a range of final products. Each research team will want to consider their research goals, decisions they wanted to influence, and what type of information they are collecting when designing the final product(s). The format and presentation of the findings will ideally reflect the specific context and decision needs and may include:

- A formal report describing results
- A webinar for decision makers and (or) the public to share findings and discuss next steps
- A webpage that community members can interface with, potentially drawing on data visualization or other creative presentation of the data

- Establishment of a working group or steering committee whose responsibility is to develop strategies based on findings
- A presentation to leadership (city council, district ranger, community watershed group, agency headquarters, and so forth)
- A grant written to fund either additional research needed or programs to address an issue (for example, funds to better provide information to Spanish speakers about drought preparedness programs)

Conclusion

Although current rapid assessment methods encompass a wide variety of approaches in many different fields, they provide “a similar set of techniques for putting trustworthy, actionable information in the hands of decision makers at critical moments” (McNall and Foster-Fishman, 2007, p. 152). Researchers rarely perform rapid assessments with the goal of adding to the general canon of science. Instead, rapid assessments are typically carried out in time-sensitive situations where conventional research projects cannot produce critical findings within the restricted timeframe. Rapid assessments are often not extensive enough to be generalizable or reproducible and may not have a big or random enough sample to meet rigorous standards for an academic paper, yet they are able to produce findings quickly enough to be useful to a specific context. As such, rapid assessments are an invaluable tool to gather preliminary data so decision makers can rapidly contextualize issues and better inform appropriate interventions.

Our hope is that this guidebook helps make this type of assessment and information about important social dimensions more accessible to practitioners making a range of decisions about drought preparedness and response. Of course, a rapid assessment approach to identify, explore, and document social dimensions will be applicable to a broad array of management decisions beyond drought. This may become a launching point or spark learning for practitioners who are making decisions without much information about the social dimensions. Practitioners may first explore the social dimensions of drought and then use this approach to investigate social dimensions of several other important management decisions they make about other natural resources, such as wildlife, fire, or rangelands. This can help create a better understanding of the social-ecological system and lead to more informed management decisions.

Part II: Social Dimensions of Drought

This guide refers to “dimensions,” or “social dimensions of drought,” which are the important key themes or issues that a researcher may choose to investigate in more depth. We include nine dimensions in this guide based on reviews of the

variables in drought decision typologies and broad literature review. While we discuss each dimension individually, they are neither discrete nor independent. Instead, they overlap in different ways depending on the specific context. We separate them out for analytical clarity and to aid researchers in selecting a subset of dimensions for their rapid assessment study.

These dimensions, and other research themes not discussed in this guide, often overlap with each other. In [figure 2](#), we present the dimensions in this guide as nine of many social dimensions, each of which can provide different insights into the same drought issue. Findings from these different dimensions can aid in diagnosing the roots of conflict, understanding break downs and failures, or improving the effectiveness of drought preparedness and response processes. They may also help practitioners expand their thinking on the issue and improve their understanding of the social system so that drought decisions can be made based on social as well as ecological and hydrological system needs.

Each dimension begins with an overview and description of the topic that defines key terms, provides background about the topic, and explains the relevance of the topic to managing drought. This initial section also highlights important literature that the research team can use for a deeper dive into the dimension. The second portion of each dimension has resources for doing research. All the dimensions include sample interview questions that focus on a range of topics within each dimension. While these were all written as interview questions, researchers can revise them to better fit other research methods. For example, sample interview questions could be re-written by someone with survey design experience to be suitable for a survey as closed ended questions, used as a Likert scale, or to solicit short answers. Similarly, these questions might be adapted to an assessment using other methods like community workshops (Lassa and others, 2020), codevelopment of causal chains (see VCAPS; www.vcapsforplanning.org), focus groups (Wheaton and others, 2008), participatory mapping exercises (Cadag and Gaillard, 2012), or others. Some of the dimensions also include descriptions, links, and data analysis guidance on key relevant secondary datasets that are publicly available. When considering dimensions that have secondary data available, the research team should first consider whether they can use those data to answer their questions and avoid unnecessarily burdening stakeholders (Dilling and Berggren, 2015), or whether the need for primary data collection remains, in which case secondary data can inform the research questions. While none of the descriptions of dimensions cover all issues that relate to that dimension, and none of the sets of sample questions or secondary data sources are comprehensive, our hope is that the material below covers some of the most important topics within each dimension, thus providing a foundation for research, allowing a research team to orient themselves and more quickly and effectively design a project.



Figure 2. The nine social dimensions of drought presented in this guide.

Dimension 1. Defining the Problem of Drought

While drought may seem like a clear-cut challenge, there are not only many different technical ways to define drought (see Box 1) but also many ways that individuals frame or understand the problem of drought (Cravens and others, 2021a; Greene, 2021). Before making decisions about drought management, it can be prudent to explore the different

ways that people frame the problem of drought (Beeton and McNeeley, 2020). Problem frames act as a lens through which decision makers and stakeholders understand an issue and perceive risk (Elliott, 2003) and shape their attitudes and beliefs (Schön and Rein, 1994). The way drought is defined or framed determines which elements of drought are prioritized, the type of knowledge deemed relevant (weather reports, farmer observations, intergenerational knowledge, cultural beliefs,

and so forth; Goldman and others, 2016; Yeh, 2016), the scale and boundaries of the problem (Hinkel and others, 2015), and ultimately which solutions are considered best (Hisschemöller and Hoppe, 1995).

Thus, if the problem is defined by a narrow group of people the solutions may only benefit that small subset of a community. Instead, opening up the process of defining drought and incorporating the perspectives of many types of water users and (or) stakeholders may not only improve how drought is conceptualized and leave practitioners with a more nuanced and complex problem definition, but it also may improve the type of solutions generated and result in a more equitable decision-making process (Ferguson and others, 2016). In addition, inviting broad participation in defining the problem may also address what is called the confirmation bias: when researchers and practitioners unintentionally design a study to collect data that confirms their own previously held opinions or beliefs (Nickerson, 1998). Engaging different stakeholders may illuminate important drought issues that a practitioner is unaware of and that are not being addressed in a decision, or worse, that are exacerbated by some of the solutions designed to respond to a narrowly defined problem of drought.

Understanding community perceptions about drought can help improve many elements of the decision-making process. Firstly, if a community is not in agreement about what type of problem drought is or even what metrics should be used to assess drought (Kohl and Knox, 2016), community input may be helpful in creating a shared definition of the drought problem. A shared understanding of the drought problem can guide what types of solutions are needed and which decision alternatives are valid and worth discussing (Cravens and others, 2021a).

See table 2 for a list of focus areas and sample interview questions related to the topic of defining the problem of drought. Greater detail for analyzing how stakeholders conceptualize drought can be found in the Cravens and others (2021a) drought typology. The typology contains guiding questions for analyzing how people define the problem of drought and it may help researchers illuminate key variables and different dimensions of the problem orientation.

Secondary Drought Definition Data

Before talking with community members or conducting primary data collection, it may be helpful to first learn about this dimension by exploring secondary data. Below is a description of one such secondary data source, the National Drought Mitigation Center’s Drought Risk Atlas. These data are useful for comparing current drought conditions to those of past droughts and may be helpful in expanding the research team’s understanding of drought, such as the climatological and hydrological factors that can be considered. This expanded knowledge may aid in conversations with community members.

Dimension 2. Decision Making

Practitioners are required to make decisions about drought as part of their work, and these decisions have significant impacts on how drought is planned for, how resources are managed during a drought, how drought is experienced by the local community, and what types of consequences result from a drought. Drought preparedness and response is the combination of many individual decisions, made at many

Table 2. Sample interview questions for Dimension 1: Defining the problem of drought.

Focus	Sample Questions
Definitions	<ul style="list-style-type: none"> • How do you think about or describe drought in the context of your community? • What concerns you most about drought in your community? • How do you know if a drought has started or occurred? Which indicators do you use to determine this? Conversely, how do you know when a drought has ended?
Spatial Scale	<ul style="list-style-type: none"> • When droughts happen [or the last drought], do they affect your whole community? Your whole region? Or are they occurring on smaller scales? If drought is occurring at multiple scales, are they affecting each other? • At which spatial scale do you think about the problem of drought? • At what scale do most decisions about drought or solutions for drought-related issues occur? (for example, individual, county, State, Federal, other)
Timing	<ul style="list-style-type: none"> • At what time of year is drought most likely to occur? • At what time of year are drought impacts the most severe? • How long do you expect drought to last? • At what frequency do you expect droughts to occur locally? Is that changing? • Do you ever have back-to-back years of drought? If so, how is this different than a single-year drought? • If you are currently in a drought, are you in the initial, middle, or late stages?
Drivers	<ul style="list-style-type: none"> • What causes drought in your area? • Is drought impacted by human activity? • Is drought changing due to climate change?

The National Drought Mitigation Center's (NDMC) "Drought Risk Atlas"

What is This Product?

"The National Drought Mitigation Center Drought Atlas project is intended to provide a wide range of decision makers with historical drought information and a web-based tool to visualize and assess their risk to drought.

"Why a drought atlas? With every drought, people ask, "How does this drought compare * * *?," and the comparisons are usually to the most recent drought, the drought of record for an area, or a historical drought such as the Dust Bowl that is remembered even beyond the area that it affected. Until now, the answers haven't been readily available for individual stations, and more often than not have only been available for climate divisions. The NDMC Drought Risk Atlas will answer all of these questions and provide user-friendly access to the data" (NDMC, 2022).

Accessing the Data

<https://droughtatlas.unl.edu/>

Data Analysis Guidance

"A station-based approach lets you find the station closest to your area of interest as well as a cluster of stations that statistically has shown similar precipitation attributes. The stations with the longest period of record, a minimum of 40 years, with the most complete record, were used to compute both the climatological and drought information to provide users with information from the best station data available, through 2017.

"The drought atlas project also recognizes that not every drought index is ideal for every location. By providing several different indices with multiple time steps, the Drought Risk Atlas gives users a vast menu of options to study and investigate drought for their region" (NDMC, 2022).

different levels, by both individuals and organizations. Further, drought related decisions are made on different timeframes and in response to different constraints. See [table 3](#) for focus areas and sample interview questions related to understanding drought decision making.

Analyzing drought decisions can help inventory what decisions are being made and by which key decision makers. This information about key decisions and when they are made can be used to identify the best points of intervention (Ray and Webb, 2016) to change current drought management. Additionally, individuals and organizations can learn by looking to past decisions (Page and Dilling, 2019).

Once a team has developed an understanding of the range of decisions being made in a landscape, it may be helpful to understand critical decisions in greater detail. Cravens and others (2021a) developed a typology that can be used to analyze drought decision making in specific contexts. The typology has four elements: how the decision is conceptualized (see "Dimension 1. Defining the Problem of Drought"), the actors involved in the decision, the decisions or actions being made, and the way that the specific decision being considered interacts with other decisions. For each of these elements, the authors provide suggested variables that can be used for researchers or practitioners to understand the element in greater detail.

Identifying and understanding barriers to drought decision making is another approach that may help explain current circumstances. Mitigation of barriers can also influence future

decisions. In other words, barriers can illuminate the present and improve the future of drought decision making. Many different types of barriers can complicate and limit drought decisions. Beeton and McNeeley (2020, p. 7–8) identify seven categories, including "institutional constraints; fragmented decision making; lack of resources to sustain efforts; lacking technology and infrastructure; climate science and information; divergent risk perceptions, cultures, values; and lack of leadership," based on the barriers described in the Bierbaum and others (2013) climate adaptation typology. Institutional constraints are one example of a barrier to drought decision making; ranchers' responses to drought are constrained by Federal grazing leases that have specific dates and do not often allow ranchers to access rangelands at different times than their original permit based on drought conditions (Wilmer and Fernández-Giménez, 2015). Once barriers are identified, it is easier to mitigate them directly, thus providing a decision maker greater agency.

Dimension 3. Individual Perceptions

The way someone perceives drought is influenced by a mix of factors and is unique to the individual. In fact, how people perceive or experience drought can differ greatly, even in the same place (Goldman and others, 2016; Kohl and Knox, 2016). Factors that shape individual perceptions of environmental conditions, including drought, consist of prior experiences (Clifford and Travis, 2018), cultural influences

Table 3. Sample interview questions for Dimension 2: Decision making.

Focus	Sample Questions
Identifying decisions and consequences	<ul style="list-style-type: none"> • What are key decisions that have been made about drought in this community? Are there any currently being considered? <ul style="list-style-type: none"> → Probe: Which decisions have been the most important? → Probe: Which actors or groups make or have made particularly important decisions that impact drought locally? • Have any decisions been made that indirectly affected drought (for example, are not focused on drought but affect drought decisions nonetheless)? • What were the consequences of these decisions? <ul style="list-style-type: none"> → Probe: Do you agree that these decisions improved drought management or were effective decisions?
Individual	<ul style="list-style-type: none"> • What decisions do you make personally about drought that affect your livelihood or wellbeing?
Temporal scale	<ul style="list-style-type: none"> • Is drought a short-term or long-term problem, or both? • Over what timeframes are drought-related decisions made? • How long do different drought-related decisions last? • (If in a drought) Are you in the initial, middle, late stage of this drought? <ul style="list-style-type: none"> → Probe: And has that affected how you make decisions? If so, in what ways?
Relationship to drought	<ul style="list-style-type: none"> • Is drought the primary reason for the decision, or does it emerge as a secondary consideration in the course of solving another problem? • How does this decision respond or impact drought? What type of consequences of drought does it pertain to? <ul style="list-style-type: none"> → Probe: Does the decision work to prepare for a future drought or respond once a drought is underway?
Barriers to decision making	<ul style="list-style-type: none"> • What barriers do you face when making decisions to prepare for drought? • What barriers to you face when making decisions in response to drought? <ul style="list-style-type: none"> → Probe: Does the barrier come from past decision making? • Is the barrier you identified something you have the power to change yourself or is it controlled by another actor or at a scale beyond you? • Do any of your drought decisions conflict with each other? <ul style="list-style-type: none"> → Probe: If so, how do you navigate those tradeoffs? → Probe: Do any of your drought decisions conflict with drought decisions made by other community members or organizations?
Level of concern	<ul style="list-style-type: none"> • How concerned are you about drought, relative to other local issues? • How concerned about drought are others in your community, compared to other local issues?

(Kahan, 2010; Nielsen and Reenberg, 2010), personal values and beliefs (Moser and Ekstrom 2010), larger worldviews about how society and the environment work and relate to each other, and even different personal identities such as gender (for example, Stets and Biga, 2003; McCright, 2010; Wilmer and Fernández-Giménez, 2016b), race (for example, Leiserowitz and Akerlof, 2010; Macias, 2016), or age (Beeton and McNeeley, 2020). There are also a number of external factors that mediate perceptions (Clifford and others, 2022). This recognition that perceptions of drought are individual leads to acknowledgement of the differences between people and how those differences—backgrounds, experiences, values, demographics, and others—shape how people understand and respond to problems and make decisions (see “Dimension 1. Defining the Problem of Drought,” and “Dimension 2. Decision making”). In addition to shaping how someone understands the challenge of drought, perceptions also influence how people understand the possible solution space and judge if actions are considered successful (Cravens and others, 2021a). With a complicated environmental issue like drought, people can disagree on what counts as drought, when a drought starts or ends, and what metrics should be used to

measure drought (Kohl and Knox, 2016). Examining individual perceptions may also illustrate how perceptions about drought or responses to it intersect with people’s identities (Wilmer and Fernández-Giménez, 2016a) or their livelihoods (Clifford and Travis, 2018).

Emotional or psychological impacts of drought, such as anxiety, grief, or loss (as is the case with climate change [Cunsolo and Ellis, 2018]) are complex, hard to quantify, and understudied (for example, Vins and others, 2015). However, these impacts can be a very important dimension of community impacts from drought, especially in communities with sustained exposure to drought (Stain and others, 2011), or that are closely connected to, or dependent on, natural resources (Coêlho and others, 2004; Greene, 2018). Vins and others (2015) conducted a systematic review of research on the mental health impacts of drought and describe how financial hardship because of drought can lead to stress, social isolation, uncertainty about the future, shame, humiliation, and possibly domestic abuse, depression, and suicide. Research also indicates that some rural populations are more vulnerable to mental health issues, because of cultural views on mental health and a culture of self-reliance that inhibits

help-seeking (Elliot-Schmidt and Strong, 1997; Fuller and others, 2000; Pierce and Brewer, 2012). Rural populations may also experience “occupational psychosocial stress” because their livelihoods, like farming, are highly impacted by drought (Berman and others, 2021). Therefore, examining this dimension may be helpful in providing a foundational understanding of the community views of drought, including particularly important actors within the community. It also may be useful to have this type of information when engaging in a community process such as developing a drought plan (for example, see Svoboda and others [2011] for a guide to and case studies of drought plan development). See table 4 for focus areas and sample interview questions related to individual perceptions of drought.

Dimension 4. Social Relationships

The relationships between different people in a community can be an important influence on drought-related decisions, especially management decisions about shared and public resources. Elements of social relationships include how different people or groups relate to or interact with each other, how they perceive each other, how they communicate with each other, and what roles they play in decision making. Histories and legacies of relationships and past decisions will often shape current social relationships, including the types of

relationships that community members have with one another, and how they react to others’ decisions. The form, frequency, and length of current and past communication between individuals and groups can also influence social relationships (Moser and Ekstrom, 2010). Together, these factors often shape whether social relationships are built on a foundation of trust. Distrust between individuals or groups often results in contentious decision-making processes (Rothstein, 2005).

There are many ways to categorize and therefore study social relationships. Ways to study social relationships include looking at social networks (Borgatti and others, 2009), stakeholder relationships (collaboration and conflict) (Satterfield, 2002), and feelings of trust (Moser and Ekstrom, 2010; Ostrom, 2010; Stern and Coleman, 2015). Types of interactions can include “resource sharing, information sharing, deliberation processes, conflicts, investment activities, and lobbying activities” (Ostrom, 2008, p. 250).

Social relationships can be studied either between individual actors or between groups of people who share an identity or position on an issue (Cravens and others, 2021a). Understanding a relationship between individuals may be important if they are actively involved in the same or inter-related decisions. In particular, the leadership styles of those in charge of decision-making processes as well as interactions among leaders can influence the success and outcomes of a decision (Moser and Ekstrom, 2010; Engle, 2012). Examining social relationships on a group scale may increase

Table 4. Sample interview questions for Dimension 3: Individual perceptions.

Focus	Sample Questions
Drought impacts on individuals and communities	<ul style="list-style-type: none"> • How are different stakeholders affected by drought? • What is the history of drought in this community? → Probe: Is there a typical drought or pattern of drought in this watershed? For example, intense one year or multiple years? • Have drought patterns and conditions been changing? If so, in what ways? → Probe: What affects has that had on you and your community? → Probe: Do you expect drought to change in the future? If so, how?
Connection to identity	<ul style="list-style-type: none"> • What type of value does water bring to your community? • What happens when there is not enough water? • Does drought threaten the identify of this place or community members? If so, how?
Focal system and drought	<ul style="list-style-type: none"> • Why is [the system] important to the community? → Probe: What value does it have? → Probe: How does it shape the community culture? → Probe: Does it shape your identity? If so, how?
Drought risk	<ul style="list-style-type: none"> • What level of risk do you associate with drought? Why? • How does it compare to other environmental risks or hazards (fire, floods, blizzards, storms, and so forth)? • Are the impacts of multiyear droughts different than single year droughts? If so, in what ways? • What other hazards or consequences do you associate with drought? → Probe: Is fire a major concern related to drought? What type of relationship do the two have? What level of risk do you associate with fire?
Psychological impacts of drought	<ul style="list-style-type: none"> • How does drought affect you or your community’s stress levels? → Probe: What consequences did that stress have on the community? → Probe: Were there other emotional responses? • When thinking about another drought, what feelings come up for you? What are you worried about?

understanding of community coherence or divisions and how large sectors of the community may be impacted by or respond to a particular decision.

Trust, or lack thereof, can be an important element of social relationships to consider. Natural resource management research has articulated different types of trust and distrust (Coleman and Stern, 2018) and shown the impact that these relationships can have on decisions, particularly contentious or high stakes decisions (Satterfield, 2002). Communities that work on the foundational issues of distrust may improve collective decision making or be able to better anticipate which actions might inflame already contentious relationships and provoke feelings of distrust (Paton, 2007). Besides distrust, Engle (2012) notes that the public's trust in behind-the-scenes water management decisions can also be a challenge for decision making, as practitioners may worry about having to explain new, adaptive actions, which may lead to a loss of confidence in the practitioners.

Social relationships are an important, but often invisible, element of decision making that has a strong influence on if decisions are considered successful or not and if they provoke conflict or community buy-in. Thus, examining social

relationships might illuminate the key intervention points or incentives for future decisions. Examining social relationships may also help influence the design of the decision process so that members of various groups are included in important decisions and can help bring their relevant communities to the table to trust the decision-making process. See [table 5](#) for focus areas and sample interview questions related to social relationships within communities.

Dimension 5. Technology

Technology can be understood as knowledge or science applied to practical use to create tools or solve problems (McGivern, 2016). The term technology can be used to describe physical equipment and systems, such as infrastructure, but it can also be used to describe things without physical properties, like computing. When we use the word technology in this guide, we are referring to both types of technology. Technology is an important research focus because it plays a central role in the relationship between hydrologic systems and people, and often specifically in how drought is experienced and where it occurs.

Table 5. Sample interview questions for Dimension 4: Social relationships.

Focus	Sample Questions
Stakeholder relationships	<ul style="list-style-type: none"> • Who are the key stakeholders working on drought in this watershed? → Probe: What are their respective responsibilities and (or) roles? Are there any clear leaders in addressing drought? • Are any stakeholders missing from the conversation about drought in this watershed? • What are the different ways these stakeholders engage with, or are influenced by, drought? → Probe: Do your perceived intentions of other community members or stakeholder groups influence your drought decisionmaking?
Stakeholder networks	<ul style="list-style-type: none"> • Which stakeholder groups currently work together? → Probe: Have they been working together for a long time, or is their collaboration more recent? <ul style="list-style-type: none"> • Which stakeholder groups do not currently work together? → Were they working together before? If so, what happened? If not, why? • Have these relationships changed over time? → Probe: Which stakeholder groups have interests and motivations that align? → Probe: Which stakeholder groups have interests and motivations that conflict? • How difficult is it to form collaborations, or alternatively stop working with, collaborators, generally? • To what extent are information or resources shared between stakeholders?
Understanding trust between stakeholders	<ul style="list-style-type: none"> • Is there trust between stakeholders working on drought? → Probe: Which stakeholders do you trust? And, for what type of actions? Why? • What are the reputations of different stakeholders working on drought? • Do you trust the organizations working on drought issues? Why or why not? • What would allow you to better trust stakeholders in the watershed? • Is there high turnover within the leadership of any of the key stakeholder groups? If so, what do you think causes this? • What are barriers to the stakeholders of the watershed working together on drought issues? • Who are the leaders in your community that you trust?
Stakeholder communication	<ul style="list-style-type: none"> • How easy it for you to communicate with other groups or local stakeholders, to share ideas, resources, and decision rationales with each other? • How frequently do stakeholders communicate? Are there formal avenues for communication (a working group, conferences, county commissioner meetings, and so forth)? • Have any stakeholders ever misunderstood communication related to drought, or interpreted it in unintended ways? If so, what was misunderstood and what were the consequences?

In the case of drought and hydrologic systems, technology can be significantly different in size and scope of impact, from large infrastructure like dams or transmountain diversions, to those with moderate impacts, like wells or pumps, to those with very localized impacts like water-efficient household appliances or automated watering systems. It can even refer to less visible types of information technologies like drought early warning systems, or to what has been termed “green” infrastructure such as constructed wetlands (Benedict and McMahon, 2002). Infrastructure such as diversions, dams, canals, and pumps can move water through the landscape and alter which areas experience drought conditions, such that drought is not just a purely a meteorological phenomenon but rather the result of human modification interacting with meteorological conditions (Van Loon and others, 2016). Because of extensive human modification of the hydrologic system, human demand for water often deviates from local meteorological or ecological conditions (Nilsson and others, 2005; Dettinger and others, 2015; Dunham and others, 2018).

Modifications to the hydrological system have led to increasing interconnectedness, especially in a case of infrastructure that moves water from one basin to another, so that a drought in one place may affect a drought in another place (Haddeland and others, 2014; Van Loon and others, 2016). New irrigation technologies such as drip irrigation have both increased adaptive capacity and made places more vulnerable

(Grafton and others, 2018), representing a sort of paradox. They have improved efficiency and made it easier to move water from one place to another, aiding in adaptation efforts, but they also have increased the amount of land used in farming, increasing farmers’ dependence on water. Thus, the size and scale of interventions from a technology or piece of infrastructure may determine how much a community is affected by drought and in some cases may have complicated implications for drought management.

Findings about how technology is involved in or shapes the hydrologic system can help determine which options are viable for practitioners as well as trace how different localities—and their drought decisions and impacts—are linked by technology. Decisions are often constrained by current, historical, or planned, future technologies that make certain strategies infeasible for a practitioner to implement. These findings may help make decisions about what type of technology, especially infrastructure, would most benefit a community, how technology exacerbates or mitigates the effects of drought, or which options are generated because of a technology. While technology likely influences all systems, this information may be especially helpful when a decision is being made by a community that will shape future technology and infrastructure projects. See [table 6](#) for focus areas and sample interview questions that explore the relationship between technology and drought.

Table 6. Sample interview questions for Dimension 5: Technology.

Focus	Sample Questions
Role of technology and infrastructure	<ul style="list-style-type: none"> • How are technology and infrastructure involved in preparing for, managing, and responding to drought in your watershed? <ul style="list-style-type: none"> → Probe: What infrastructure or technology are important to this watershed? → Probe: How do they affect drought? • Are there water efficiency issues? If so, what type? What consequence do these have for drought? <ul style="list-style-type: none"> → Probe: How are these inefficiencies affecting drought in the watershed? → Probe: Are there any plans or momentum to address inefficiencies? If so, what? If not, what are barriers to addressing these inefficiencies?
Legacies of technologies and infrastructure	<ul style="list-style-type: none"> • What are the histories of the use of water technologies or infrastructure projects in this watershed? • Where are they in their lifespan? (for example, how long ago were they implemented and how long was the infrastructure/technology designed to last?) <ul style="list-style-type: none"> → Probe: Are any infrastructure systems (or technologies) important to drought aging, approaching the end of their lifespan, or past their intended lifespan? → Probe: Are any infrastructure systems (or technologies) important to drought currently failing? If so, what are the consequences? → Probe [if dams are important to the watershed]: When are dams next due for relicensing?
New technologies and infrastructure	<ul style="list-style-type: none"> • Are new technologies being considered? If so, what? <ul style="list-style-type: none"> → Probe: How would these affect drought preparation, management, or response in the watershed? • Are new infrastructure projects being proposed? If so, what? <ul style="list-style-type: none"> → Probe: How would these affect drought preparation, management, or response in the watershed? • How is the transition between new and old envisioned? With what tradeoffs? <ul style="list-style-type: none"> → Probe: Which stakeholders are supportive and unsupportive of the new technology? → Probe: Who benefits from this transition and who might be burdened? → Probe: Who is making the decisions about the new technology or infrastructure? To what extent is there conflict or consensus? → Probe: How do laws or policy shape water technologies? Are they ever a barrier to implementing technology?

Dimension 6. Economic Impacts and Livelihoods

Water is a resource that is valued both for itself (for example, water supply) and as an input into other goods and services (for example, crop production). As a result, drought can influence diverse economic sectors and affect the livelihoods of many members of a community in different ways. Economic impacts can include direct effects from drought like disruptions to agricultural production, sales, and costly source water alternatives (for example, pumping groundwater) or a slew of secondary effects including replacing household water supply when a well goes dry as the water table drops, decreased tourism, closures due to wildfires, fees or burdens for violations of environmental regulations, decreased resource or agricultural employment opportunities, food insecurity, decreased tax revenues, costs due to health impacts, and so on. Understanding livelihoods can help illuminate which sectors of a community are most vulnerable to drought so that those risks can be mitigated and to help plan programs for those impacted. This dimension explores how the economic composition of a region is influenced by water availability and how livelihoods or economic sectors might be influenced by drought. Understanding the economic consequences of drought can help drought decision making by informing

which options are feasible, viable, and cost effective, as well as helping understand how markets influence other parts of the system that are not captured in the market (for example, externalities). See [table 7](#) for focus areas and sample interview questions related to the economic impacts of drought.

Secondary Economic Impacts and Livelihoods Data

This guide already discussed the tradeoffs between primary and secondary as well as quantitative and qualitative data (see “Data Considerations”) that the researcher needs to consider when designing a research study. Collecting primary data for a larger-scale economic analysis will likely be beyond the scope of a rapid assessment because of the time and costs associated with large scale data collection. “Economic impacts and livelihoods” is one of the dimensions that generally has the most secondary data available, at least at the community or county level. Below are two datasets that may be helpful in examining the economic impacts of drought. The researcher may use this as background data to acquaint themselves with the larger economic trends in a place and focus their qualitative research (employing a sequential approach) or may be able to answer their questions through analysis of secondary data alone.

Headwaters Economics’ “Economic Profile”

What is This Tool?

The “Economic Profile” provides reports of socioeconomic data at the community, county, and State levels. This can be very helpful in understanding current conditions, trends over time, and a broader view of the economy. In fact, the FS uses it as part of their “Human Dimensions Toolkit” to provide information for decision making. One significant shortcoming of the tool, however, is that the tool lacks data in many rural areas.

Accessing the Data

<https://headwaterseconomics.org/tools/economic-profile-system/>

Data Analysis Guidance

Headwaters Economics created tools that generate county-level reports building off the “Economic Profile” specifically for the FS, Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service. These tools are a great place to look if the “Economic Profile” has little data for a rural area. They have similar data, so you might select the best report based on the type of Federal land in the watershed (for example, whether it has FS or BLM land). These reports compare economic indicators of the specific region or county to the average for the United States to provide a more comprehensive view of the economy. These reports are useful for viewing trends over time, analyzing key sectors of the economy, and using different indicators to determine the strength of the economy and how it compares to other local economies across the country.

- BLM Socioeconomic Profile: <https://headwaterseconomics.org/tools/blm-profiles/>
- FS National Forest Socioeconomic Profile: <https://headwaterseconomics.org/tools/forest-indicators/>
- U.S. Fish and Wildlife Service (works if there is a National Wildlife Refuge in the area): <https://headwaterseconomics.org/tools/usfws-indicators/>

Table 7. Sample interview questions for Dimension 6: Economic Impacts and Livelihoods.

Focus	Sample Questions
Economic Profile	<ul style="list-style-type: none"> • What are the largest economic sectors in the community? • Which ones have a direct link to water or would be directly affected by drought? • Which sectors have a low likelihood to be affected by drought? • How easily can sectors economically affected by drought (such as water utilities) pass costs on to consumers?
Livelihood Impacts	<ul style="list-style-type: none"> • What livelihoods or industries in the community rely on water? When do they require water? How much flexibility or substitutability is there? → Probe: What options do people have in times of water shortage? • Was your livelihood affected by past drought? → Probe: If you are comfortable sharing, can you tell us how that affected you and your business, organization, or family? • Are there any stakeholders for whom it is more difficult to access financial assistance, such as insurance or loans, that might buffer against the economic impacts of drought?
Community Impacts	<ul style="list-style-type: none"> • During previous local droughts, which community members experienced economic impacts? → Probe: How were they affected? → Probe: Which ones experienced the most significant effects? • Were you surprised by who was or was not affected in previous droughts? How so and why?

National Drought Mitigation Center's (NDMC) "Drought Impact Reporter"

What is This Product?

The National Drought Mitigation Center (NDMC) produces the Drought Impact Reporter, which provides a map and reports associated with drought impacts across the United States. According to their website, "We systematically scan news stories, looking for "a loss or change at a specific place and time due to drought," providing a preliminary historic record and sometimes insight on emerging conditions."

Accessing the Data

<https://droughtimpacts.unl.edu/>

Data Analysis Guidance

The Drought Impact Reporter provides drought impact data that are sortable by economic sectors (for example, agriculture; business and industry; energy; tourism and recreation) and at multiple scales (national, multistate, State, county, city). Data come in the form of an interactive map and summaries with links to the various reports where the data come from. These reports may also be helpful to read, especially if they are specific to your region. In general, these data may be useful if you are looking for summarized data about effects of drought, as well as access to information on specific drought impacts.

Dimension 7. Water Governance

Water governance refers to the rules that determine who has access to water, at what time, what quantity, what quality, and for what purposes. Most of the time these rules are formal, taking the form of laws, policies, regulations, or agreements, and managed by organizations or government agencies. Formal rules are usually legally enforceable, which means that they are often adopted and followed by the majority of people. Given that water is not fully a market good, and is in such high demand, policies and laws are important and often

necessary in determining how water is used. However, water governance also may include informal rules that guide use, whether in the form of social norms about what type of use is right, or voluntary agreements between users. Studying informal governance will likely require a different research design than presented in this guide and is probably only important in communities where informal rules play a significant role in management and use.

Understanding water governance locally, particularly how it shapes drought conditions, may be critical for understanding key intervention points and identifying constraints or

limitations on actors or drought response actions (Stakhiv and others, 2016). For example, water law in the western United States often disincentivizes voluntary efficiency improvements by water rights holders because if they are not putting their rights to use, they can be taken away—a phenomenon often referred to as “use it or lose it” (Tarlock, 2000). In these cases, senior water rights holders may be able to decrease water use, leaving more water in the system for environmental uses or use by junior water rights holders, but they decline to do so because of the risk it poses to their property rights (Tarlock, 2001). Understanding current water governance structures may also help incentivize better drought preparedness and response and help target key governance changes in a way that incentivizes efficiency and promotes creative adaptation strategies. See [table 8](#) for focus areas and sample interview questions related to water governance.

Secondary Water Governance Data

Analysis of laws, policies, or other documents governing the use of water is one way of understanding institutional context without collecting primary data. For an example of this approach, see McEvoy and others (2018).

Dimension 8. Information

Information about drought or water can take the form of formal knowledge (for example, science), informal knowledge (for example, experienced, local, or traditional), or often a combination of the two (Goldman and others, 2011; Clifford and Travis, 2018). The information people have access to, and are able to use, will shape their understanding of a system, its problems, its priorities, and its benefits. This understanding of the system will also influence which solutions, strategies, or decision alternatives are considered the best or most salient. Importantly, one thing that can change someone’s understandings of a system is if new information becomes available. New information can provoke learning and change an individual’s mental models of the system (Jones and Boyd, 2011; Otto-Banaszak and others, 2011). Once a drought is underway, timely information generated from monitoring can help communities evaluate the efficacy of drought management strategies and revise them if needed to respond nimbly to unforeseen issues. However, new information does not always prompt learning and change thinking; if information is not considered usable—specifically salient, legitimate, and credible (Cash and others, 2003)—then it may be disregarded or ignored.

Table 8. Sample interview questions for Dimension 7: Water governance.

Focus	Sample Questions
Organizations	<ul style="list-style-type: none"> • What institutions play a role in drought preparedness, management, and response? <ul style="list-style-type: none"> → Probe: Consider asking individually if the interviewees have high levels of familiarity with institutions: <ul style="list-style-type: none"> ○ What institutions play a role in drought preparedness efforts (working before a drought hits)? ○ What institutions play a role in drought management efforts management and response efforts (working during and after a drought)? ○ How do institutions influence or constrain one another?
Specific/central organization	<ul style="list-style-type: none"> • Who are the leaders or people you know within this organization? • Do you know how decisions are made within the organization? • Are boundaries of the service or focal area clearly defined? If so, what are they? If not, why? • Do individuals or members have a say in the rules, agreements, and management strategies? • Are there consequences if individuals/parties/members do not follow rules or agreements?
Policies, regulations, and laws	<ul style="list-style-type: none"> • What policies, regulations, and laws shape drought management in the watershed? • Which policies, regulations, and laws support the management of drought? Please explain. • Which policies, regulations, and laws are barriers to drought management? Please explain. • What policies, regulations, and laws are needed that don’t currently exist? And why?
Politics	<ul style="list-style-type: none"> • Does the current political climate play a role in drought management? If so, how? <ul style="list-style-type: none"> → Probe: Do you expect any major changes to the political climate? • In your opinion, what role should [level of government] play in managing drought? <ul style="list-style-type: none"> → Probe: Do you believe they are playing this role currently? • Is there any opposition to current elected officials’ stance on drought management?
Water rights	<ul style="list-style-type: none"> • How do water rights, and water law more generally, play a role in drought? <ul style="list-style-type: none"> → Probe: Who in your community has the most or most secure water rights? And, who has the least or least secure water rights¹?

¹This applies in places where water rights fall under the prior appropriation doctrine (primarily the West) but not to areas that have the riparian doctrine.

National Drought Mitigation Center (NDMC) State Plan Database

What is This Product?

This webpage from the National Drought Mitigation Center (NDMC) provides information about various States' drought planning documents. The NDMC also provides examples of Tribal and international drought planning documents.

Accessing the Data

<https://drought.unl.edu/Planning/DroughtPlans/StatePlans.aspx>
<https://drought.unl.edu/planning/DroughtPlans.aspx>

Data Analysis Guidance

If you would like to know more about how different States are planning for drought, this page provides the name each State's drought plan, as well as the year the plan was implemented. Some plans are linked directly to a webpage where the plan can be downloaded; other plan names must be looked up on a search engine. This secondary data source, and in particular your State's plan, may be useful context to be familiar with before asking interview questions related to water governance. Tribal, regional, watershed-level, and local drought or water management plans may also provide useful context, though they are not necessarily available through the NDMC website.

Uncertainty can be an important theme to examine within this dimension. In most cases, uncertainty about future conditions can be a critical barrier to environmental management decisions (Archie, 2014) and may play an important role in preparing for drought. Uncertainty can take many forms. It can occur when it is truly impossible to definitively know something (for example, the future); it can occur when something is known in fragmented or patchworked ways (Shattuck, 2021); it can occur when science is incomplete or "undone" (Frickel and others, 2010), as well as many other different forms. Even when there is information available, uncertainty can arise when sources have conflicting information and practitioners have insufficient guidance on how to choose the best source among possible options (Esch and others, 2018). Importantly, uncertainty can have significant influence over management decisions—like those about drought—with some practitioners feeling like it is best to wait until there is more certainty for a decision and others feeling urgency to intervene (Clifford and others, 2020).

When information is considered useful and relevant, it can influence peoples' beliefs as well as their decisions, meaning that information about drought can directly shape the actions people take in anticipation or response to drought. One example of this is that practitioners are often required to use the "best available science" for decision making and understanding information gaps. As a second example, what might be needed or considered useful may help identify important next steps in a decision process. Findings from this dimension may help to prioritize new monitoring projects or information generation, to increase sharing of information sources between actors, or to generate consensus on what information should

be considered the best available science for local practitioners making decisions about drought. See [table 9](#) for focus areas and sample interview questions related to understanding drought information availability and use.

Dimension 9. Social Vulnerability

Drought can have uneven effects on a community, leaving some community members to face much greater burdens or hardships than others. Social vulnerability of drought refers to the sensitivity of different individuals or stakeholder groups to drought impacts and their ability to withstand the negative affects to which they are exposed (see Adger, 2006, for greater discussion of vulnerability and its components). For example, Greene (2018) describes the drought vulnerability of agricultural farmworkers in California in terms of water security. Because their homes are not connected to municipal water supplies, they rely instead on shallow wells that dry up during drought. Elderly and disabled residents were particularly vulnerable because they had more difficulty reaching water distribution points (Greene, 2018). For a more urban example, Dow (2010) describes how drought in North Carolina damaged the lawn care industry, leading to fewer hires of seasonal and part-time laborers, many of whom are from minority communities. Given that lawn care is a low-paying sector, these laborers may also have fewer savings and thus be more vulnerable to income loss.

Social vulnerability is often shaped by factors predating drought that are part of the larger social system. For example, using the water supply example above, farmworkers may not

Table 9. Sample interview questions for Dimension 8: Information.

Focus	Sample Questions
Information sources	<ul style="list-style-type: none"> • Where do you get information about drought? How many sources do you use? • Which sources do you find most useful and why? • Which sources do you find least useful and why?
Information use	<ul style="list-style-type: none"> • Where are community members and stakeholders getting knowledge about drought and drought impacts? • Does some information feel less accessible to you? If so, why? • What information is most useful for preparing and responding to drought? • Can you think of anyone who wouldn't be able to access important drought information? If so, why? • How do you find out about new information sources? How do you evaluate data or information quality?
Monitoring efforts	<ul style="list-style-type: none"> • What type of drought-related monitoring is going on in the watershed? • What indicators are available from drought monitoring information? • How much data are available from drought monitoring information?
Forecasts	<ul style="list-style-type: none"> • How effective are drought forecasts and drought declarations? • Do you use them in decision making? • If so, how do they help you make decisions or respond to drought-related impacts? • Do you use longer-term projections about how drought severity and frequency may change in the future (for example, climate forecasts)?
Data gaps	<ul style="list-style-type: none"> • Are there data gaps in the drought monitoring information? What kind? <ul style="list-style-type: none"> → Probe: Has the monitoring provided insight into trends or efficacy of actions? → Probe: Has the monitoring led to revised or changed strategies to respond to drought? → Probe [if there isn't much local monitoring]: What are the consequences for knowledge of drought and drought management?
Uncertainty	<ul style="list-style-type: none"> • Does uncertainty play a role in your drought management? If so, how? <ul style="list-style-type: none"> → Probe: Does uncertainty on any of the following topics impede your drought decision making: time, size or extent, intensity, drought impacts? → Probe: How do you make decisions despite of that uncertainty? What strategies do you use?

Drought Vulnerability Assessment with Tribes

For more information about how to conduct vulnerability assessments with Tribal partners, and ways to incorporate local or traditional knowledge into the assessment, visit:

<https://cig.uw.edu/resources/tribal-vulnerability-assessment-resources/>

<https://nwcasc.uw.edu/partners/tribal-partners/>

have been able to live in a place with a municipal water supply; instead, they may have been limited to places that require them to draw their water from wells. Their options may be limited by historic development patterns and a systematic absence of rural water supply infrastructure (Carillo, 2014; Gasteyer and others, 2016; Greene, 2018). Gasteyer and others (2016) found that non-White, and especially American Indian and Alaska Native households, are statistically less likely to have access to complete plumbing facilities. A lack of water supply access can increase drought vulnerability. Factors that might increase social vulnerability include poverty, mental and physical health concerns, disability status, minority status (including race, ethnicity, sexual orientation, religion, and so

on), lower education levels, social and physical isolation, lack of connection to institutions or avenues of power, and being a non-native English speaker, among others.

Examining social vulnerability can help practitioners understand why drought has a bigger effect on some groups within a community as compared to others, and why some groups are more resilient or able to bounce back after a drought or period of water restriction. Identifying particularly vulnerable communities can help practitioners decide where it would be most effective to send resources, and which communities might be disproportionately affected by drought management decisions. Ultimately, drought management, and the many decisions wrapped up in it, has environmental justice implications (Feinstein and others, 2017; Wikstrom and others, 2019). This is true of many different types of environmental

Social Vulnerability Index (SVI)

What is This Tool?

“Social vulnerability refers to the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss. The [Center for Disease Control and Prevention’s] Social Vulnerability Index uses 15 [United States] census variables at tract level to help local officials identify communities that may need support in preparing for hazards or recovering from disaster.” (Agency for Toxic Substances and Disease Registry, undated)

Accessing the Data

<https://svi.cdc.gov/prepared-county-maps.html>

Data Analysis Guidance

Examine the maps generated for your county(s). Sample questions help you think about these data in terms of vulnerability and drought.

“Overall Social Vulnerability” map (provides a general assessment of social vulnerability based on census data on economic factors, education, family characteristics, housing, language ability, ethnicity, and vehicle access, among other factors): Which areas have the highest social vulnerability? How much disparity is there within your county(s)? What drivers might help explain the patterns you are seeing? Do any of those drivers relate to drought? If so, how?

“Socioeconomic Status” map (compiles census data on poverty, unemployed, per capita income, and no high school diploma): How much disparity is there within your county(s)? What areas are the darkest/have the highest socioeconomic vulnerability? How does that align with different stakeholders or drought impacts?

“Household Composition/Disability” map (compiles census data on populations 65 years and older and 17 years and younger, single-parent households, populations 5 and older with a disability): How does this map compare to the socioeconomic map? Are there any drought concerns related to age or disability?

“Race/Ethnicity/Language” map (compiles census data on minority populations and English language ability): How might lack of fluency in English make communities more vulnerable to drought than others? What type of materials might they not have access to? How might racial dynamics shape community relations?

management decisions, such as fire mitigation (Adams and Charney, 2020), as decisions often produce winners and losers, or some community members who benefit from management actions and others who are burdened with the consequences or costs. See [table 10](#) for focus areas and sample interview questions to investigate how drought effects may be differentially experienced.

Secondary Vulnerability Data

In the boxes above and below are a few tools to explore social vulnerability via secondary data. As discussed in the “Data Considerations” section and in “Dimension 6. Economic Impacts and Livelihoods,” there are advantages and disadvantages to using primary versus secondary data. In the case of social vulnerability, we suggest the use of both primary and secondary data in concert. Secondary data can provide background information about social vulnerability in the community or region. Primary data (for example, interviews, surveys) can

provide detail about a specific community, subcommunity, or context. It would be difficult to understand social vulnerability with only secondary data because it would not be context-specific enough, but it would be difficult to understand with only primary data collected via rapid assessment, because it would not be detailed enough. For example, in a community dependent on drying domestic wells, secondary data might indicate large populations of elderly residents or community members with low socioeconomic statuses, both of which could be a barrier for regularly purchasing bottled water. Understanding that there are populations that may have issues with mobility, low rates of vehicle ownership, and difficulty affording alternative water sources may lead decision makers to develop a plan to truck in water to these vulnerable communities. These secondary data are also limited in that they determine level of vulnerability based on demographic characteristics, but demographics may not always accurately predict who is most vulnerable to drought. For example, Chicago had an extreme heat wave in 1995 that killed more than 700 people in

Table 10. Sample interview questions for Dimension 9: Social vulnerability.

Focus	Sample Questions
Local inequalities	<ul style="list-style-type: none"> • Who in your community is most at risk from drought? <ul style="list-style-type: none"> → Probe: Which communities were most affected or harmed in previous droughts? → Probe: Which communities took the longest time to recover from previous droughts? • Does anyone benefit from drought in your area?
Exposure	<ul style="list-style-type: none"> • What elements or sectors of the system are most at risk? Why? <ul style="list-style-type: none"> → Probe: What are the consequences that those most at risk experience when there is a drought? • Are there certain neighborhoods or communities that experience more extreme impacts from drought?
Marginalized communities	<ul style="list-style-type: none"> • Which communities, neighborhoods, or groups of people have the least resources and the greatest struggle, even when there isn't a drought? <ul style="list-style-type: none"> → Probe: How are those communities affected by drought? → Probe: Which communities, neighborhoods, or groups of people are the most affected by drought specifically? • In past droughts, has drinking water access ever been an issue? If so, what happened? <ul style="list-style-type: none"> → Probe: If not, do you think that local drinking water could be threatened by future droughts? If so, where and in what cases?
Tribal populations	<ul style="list-style-type: none"> • How do water shortages affect the Tribal community? • How does the Tribe(s) participate in resource/water management in this watershed? • How is [focal concern] valued by or important to the Tribe?

Headwaters Economics' "Populations at Risk"

What is This Tool?

“Understanding the location and extent of populations at risk can be critical to community decision making. The Populations at Risk tool generates customized socioeconomic reports about populations more likely to experience adverse social, health, or economic outcomes due to race, age, gender, poverty status, or other factors” (Headwaters Economics, 2022).

Accessing the Data

<https://headwaterseconomics.org/tools/populations-at-risk/>

Data Analysis Guidance

Regardless of what background data are used, this tool should be able to inform a greater understanding of social vulnerability, particularly the differences (for example, inequalities or unevenness) in the focal community. These data can provide information into which populations might be most vulnerable and based on what different factors (as vulnerability due to income might be different than due to other factors like disability status or lack of English language skills). The goal is to understand which populations are vulnerable, think critically about why those populations are vulnerable, and consider how those vulnerabilities might intersect with drought and drought impacts. Two concrete ways that background information can be used are 1) to check participant guides to be sure that vulnerable populations are part of the study, and 2) to incorporate findings into interview questions. This might mean designing a question to focus on a specific group of people, such as to ask how drought affects them specifically, or a question that explores a surprising result from the background data.

Additionally, data are available for download if the researcher has quantitative data analysis skills and would like to further explore findings and trends.

U.S. Environmental Protection Agency's "EJSCREEN: Environmental Justice Screening and Mapping Tool"

What is This Tool?

"EJSCREEN is an environmental justice mapping and screening tool that provides [the U.S. Environmental Protection Agency] with a nationally consistent dataset and approach for combining environmental and demographic indicators. EJSCREEN users choose a geographic area; the tool then provides demographic and environmental information for that area. All of the EJSCREEN indicators are publicly available data. EJSCREEN simply provides a way to display this information and includes a method for combining environmental and demographic indicators into [environmental justice] indexes" (EPA, 2022).

Accessing The Data

<https://www.epa.gov/ejscreen>

Data Analysis Guidance

The data in this tool can provide information into which populations or geographic areas are particularly vulnerable to environmental hazards. Users can select a particular geographic area, and then add map layers, which include 11 environmental indicators (for example, "Ozone," "Traffic Proximity," "Hazardous Waste Proximity"), 6 demographic indicators (for example, "Low Income Population," "People of Color Population," "Over Age 64"), and 11 environmental justice indices that combine each of the environmental indicators with all of the demographic indicators. This tool may be helpful in thinking about how environmental justice issues intersect with drought and its effects, in identifying which environmental justice issues are most salient within the practitioner's study area, and in identifying populations that are particularly affected by environmental justice issues, who may also be vulnerable to drought.

Additionally, data are available for download if the researcher has quantitative data analysis skills and would like to further explore findings and trends.

a week, puzzling experts as to why it had such extreme impacts and why the impacts were so uneven, even amongst vulnerable communities. Klinenberg (2015) conducted a "social autopsy" to better explain why some low income, Black communities suffered extreme losses while other similar communities suffered less than even wealthy neighborhoods. He argues that a key variable to understanding vulnerability is social connections; places where people had close relationships with neighbors were less vulnerable than neighborhoods lacking community ties. This is an example that complicates an understanding of vulnerability, indicating that some aspects of vulnerability can be hard to analyze with standard quantitative data (socio-economic status, race, and so forth).

Part III: Using the Guide

This final section of the guide describes two hypothetical examples of how someone might use the guide in practice. Each describes the decision context in which someone might decide to use this guide, the dimensions they might choose to examine, and how their findings might inform their decision making or actions in the future. We hope that these examples

will demonstrate how this guide is able to augment your decision making with information about the social dimensions of drought.

Example 1: Setting the Groundwork for a Community Meeting

Sandra is the head of a local watershed nonprofit, and one of their major aims is to support fishery health. She recognizes that to successfully support fisheries during drought, she must collaborate with local, State, Federal, and Tribal agencies and other community members, whose actions also affect local fisheries. She turned to this guide because she hopes to augment her understanding of fisheries health with a better understanding of local social issues related to drought before she convenes a meeting to discuss drought management for fishery health.

Sandra has been living in her region for some time, so she knows most of the local organizations and agencies who might want to be involved. However, she is not sure how different organizations or individuals may be thinking about drought management issues, nor does she have a complete understanding of those organizations' relationships with each other, all of

which might affect the meeting outcome. She decides to take a broad-scope approach to analyzing the social dimensions of drought, so she starts by choosing “Dimension 1: Defining the Problem of Drought” to help her make sure she is on the same page with other meeting attendees about what drought is and the problems associated with it in their watershed. She also chooses to focus on “Dimension 4: Social Relationships” in order to map out existing relationships between community members and to identify groups that in the past have not been a part of drought management discussions.

Sandra hires a social science researcher from the local university, Anwar, to interview community members and learn more about how they define drought, the issues they care about, and their history of collaboration. Through Anwar’s snowball sampling methods, Sandra learns that her list of relevant organizations and community members includes not just the local FS office, the local Tribe, farmers, ranchers, commercial fishing guides, and river rafting business owners, but also a homeowner’s association, a community group representing low-income residents who rely on fish from the river for subsistence, and several lawn care businesses. She makes sure to invite representatives from all these groups to the meeting.

The data from Dimension 1 gives Sandra insight into how groups differ in their definitions of drought. For instance, Sandra learns that local farmers define drought according to whether they will have access to stored water during the irrigation season, rather than whether there is water in the rivers, so Sandra makes a plan to acknowledge the difference in definitions when discussing the issue of drought for fisheries. Sandra also learns that the river rafting business has high turnover in its middle management, so she makes sure to contact the head of the business, who has lived in the area for a long time, and personally invite him to participate.

By the time she has convened the meeting, Sandra has learned about the social ties between the groups she will be speaking with through the information gathered in Dimension 4. For example, she now knows that the fly fishing and river rafting business owners have collaborated in the past to avoid tour conflicts, but the lawn care business owner and farmers have clashed in the past. Given the complicated interpersonal dynamics in the town, Sandra decides to hire a professional facilitator to help her run the meeting. As a result of this preparation, the attendees of the meeting are able to have a frank and honest discussion about the need for voluntary water reductions during the fish spawning season. Sandra knows that getting agreement to take action will be a much longer process, but she is pleased that the group is off to a successful start and participants seem willing to continue the discussion.

Example 2: Gathering Social Context for a Drought Plan

Natasha is a resource manager with the Bureau of Land Management. She is in charge of developing a drought management plan that determines when and where livestock grazing can occur on lands within her unit, during different stages of drought. The plan will be used to avoid overgrazing and other negative impacts on vegetation and other vulnerable natural resources like riparian corridors. Since she is new to her position and not from the local area, Natasha does not know much about the local ranching community, or who might be most affected when grazing is curtailed during drought, which will be important because her drought plan will need to comply with the National Environmental Policy Act (NEPA). According to NEPA regulations, she must provide alternative management options, and justify why she has not chosen them. Natasha wants to make sure she has a greater understanding of social context before she shares the plan, so that she does not encounter any surprises during the public comment period.

Natasha’s examination of the social dimensions of drought has a narrow scope, since she intends a particular use for the information she will gather. She chooses to look at the economic impacts and livelihood and social vulnerability dimensions. First, she reviews the gray literature, such as reports, as well as peer-reviewed research on rancher livelihoods in this context. Then, she looks at the Headwaters Economics Economic Profile data tool to get a better sense for the key economic sectors in the area. Some of the relevant counties are missing data, but she is able to get a general sense for how ranching fits into the overall economy. She plans to gather more information on the ranching sector through primary data collection. She also looks at the Social Vulnerability Index to determine whether there are any particularly vulnerable populations that need to be given particular attention.

Natasha contacts a Federal social scientist, Rhoda, who has agreed to design and conduct an interview study to learn more about the social dimensions of ranching in the area. Through Rhoda’s study, Natasha learns that not only is there a large ranching community that relies on BLM lands for grazing, but also a large community of low-income residents who do not own ranches but work on those properties. Furthermore, Natasha learns that ranchers in the area suffered from a prolonged drought about ten years ago, during which time agency grazing rules were perceived to be confusing and inconsistently implemented. She plans to use all this information to inform the development of the drought plan as well as to design outreach efforts to introduce the plan to the local ranching community.

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Appendix 1. History of Rapid Assessment

History and Current Use Contexts

In the 1970s, agricultural researchers began developing rapid methods of assessment (Fitch and others, 2000; Beebe, 2004). The first technique to grow out of this research, rapid rural appraisal (RRA), was established in an attempt to circumvent the time and monetary challenges associated with traditional farming systems research (Food and Agriculture Organization, 1997). Later, as anthropologists sought to engage local populations, incorporate their experiences and knowledge in assessments, and foster local ownership of research, participatory rural appraisal (PRA) emerged as an alternative method to RRA (Chambers, 1994; Mueller and others, 2010). RRA and PRA provided a foundation for contemporary rapid assessment methods, many of which share PRA's emphasis on participatory research and stakeholder engagement. Today, several different fields have adopted rapid assessment as a tool to inform critical decision making.

Health professionals were among the first to widely implement rapid assessments. International aid agencies began administering rapid assessments across the world in the 1980s and 1990s, helping accelerate the health community's acceptance of rapid methods (Fitch and others, 2000). Modern health assessments, like Bile and others' (2010) health cluster approach to assessing internationally displaced persons or Brennan and Rimba's (2005) post-tsunami rapid health assessment, engage the affected populations and assess complex health crises in real time. Other assessments focus on response staff and how their efforts might benefit or limit relief efforts (for example, Brahmabhatt and others, 2009). Increasingly, rapid assessments have become standard protocol for managing health emergencies and guiding health interventions.

Disaster management has also embraced the ability of rapid assessments to provide quick, actionable information. Garces and others' (2010) rapid appraisal of fisheries management systems allowed researchers to integrate local community knowledge with outside professional experience to assess the environmental and social impacts of a tsunami on coastal fisheries. Similarly, Atuyambe and others (2011) outline the rapid water, sanitation, and hygiene assessment they conducted in refugee camps after a landslide displaced roughly 5,000 individuals. There, they evaluated appropriate postdisaster interventions and helped coordinate national and international relief. Such diagnostic tools quickly prioritize community and livelihood needs in the wake of natural disasters.

Rapid assessments are needed to inform resource management decisions, though generally not in the context of drought. Ecological risk assessments quantify ecological

health and uncover pressing ecological risks. Researchers have conducted ecological risk assessments to determine stream ecosystem health (Spence and others, 1999), formally rank anthropogenic risks to target species within a fishery (Grubert and others, 2010) and evaluate ecosystem well-being under different management regimes (Smith and others, 2003). Other approaches, like the World Wildlife Fund for Nature's Rapid Assessment and Prioritization of Protected Area Management (Ervin, 2003) or Hjortso and others's (2005) Rapid Stakeholder and Conflict Assessment, emphasize how social considerations affect natural resources. The Rapid Assessment and Prioritization of Protected Area Management assesses management effectiveness and elucidates conservation threats, while the Rapid Stakeholder and Conflict Assessment identifies key stakeholders, conflicts, and livelihoods within conservation or protected-area communities.

Rapid assessments have also been conducted to better understand longer-term climate impacts. Climate change vulnerability assessments synthesize scientific information to inform climate management actions (Joyce and Janowiak, 2011). A climate change vulnerability assessment can assess social vulnerability to climate change (for example, Tambe and others, 2011; Krishnamurthy and others, 2014) or evaluate habitat vulnerability (for example, Commission for Environmental Cooperation, 2017). Policy makers and managers can thus set climate management priorities and inform adaptation measures.

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Appendix 2. Rapid Assessment Publications

Table 2.1. Rapid assessment publications reviewed in the creation of this guide.

	Reference	Context used
1	Aalst and others (2008)	Diagnostic tool for community-based climate change and disaster risk reduction
2	Atuyambe and others (2011)	Evaluate hygiene, sanitation, and clean water access in refugee camps post-landslide
3	Bile and others (2010)	Collect data on postdisaster health needs, infrastructure and perceptions among displaced populations, as well as sanitation and nutrition information
4	Bosco and others (2013)	Categorize pre- and postfire landslide susceptibility
5	Brahmbhatt and others (2009)	Evaluate public health employees' preparedness and the adequacy of their training in post-disaster scenarios
6	Brennan and Rimba (2005)	Determine the public health effects of a tsunami
7	Brown and others (2016)	Determine social and ecological vulnerability of rangelands to drought
8	Commission for Environmental Cooperation (2017)	Characterize the climate vulnerability of a habitat and analyze climate-informed management approaches
9	Ervin (2003)	Identify pressing issues in protected areas
10	Fennessy and others (2007)	Literature review of rapid methods used to assess the ecological condition of wetlands
11	Garces and others (2010)	Diagnostic tool to assess the status of tsunami-affected coastal fisheries
12	Grubert and others (2010)	Rank the risks to sustainability for various target and byproduct species in a fishery
13	Hjortso and others (2005)	Preintervention analysis of mangrove use and stakeholder interactions with and impacts on the natural resource
14	Johnson and Vindrola-Padros (2017)	Systematic literature review of rapid qualitative methods employed in health emergencies
15	Joyce and Janowiak (2011)	Identify and understand impacts to selected resources and ecosystems
16	Kienast and others (1998)	Understand the long-term ecological effects of climate change on mountain forests in Southern Central Europe
17	Knutson and others (2001)	Analyze agricultural producers' perceptions of drought vulnerability
18	Krishnamurthy and others (2014)	Systematically analyze national food security vulnerability in the face of climate change
19	Lasage and others (2008)	Analyze the effectiveness of sand dams in reducing drought vulnerability
20	Meldrum and others (2015)	Analyze the risk perception gap between the public and wildfire professionals
21	Mueller and others (2010)	Analyze the effectiveness of traditional ecological knowledge in assessing biodiversity compared to traditional vascular plant biodiversity surveys
22	Ruediger and others (2003)	Analyze existing geographic information to identify potential wildlife and fish habitat linkage areas along highways
23	Smith and others (2003)	Evaluate peat fire risk and wading bird habitat suitability to map drought-related ecological risk
24	Spence and others (1999)	Evaluate fish community and assess stream habitat to determine the overall integrity of stream ecosystems
25	Tambe and others (2011)	Microscale study to characterize vulnerability to climate change in rural villages
26	Zhou and others (2009)	Estimate biological sustainability of teleost bycatch species in trawl fisheries

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