



AMS
American Meteorological Society

Supplemental Material

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Table S1: Sampling Strategy: Interviewees by Category. (Table reprinted from Raheem et al 2019

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<i>Category of NDRP Partner</i>	<i>Total # of partner orgs listed in NDRP workplanⁱ</i>	<i># of organizations eliminated from sampleⁱⁱ</i>	<i># of organizations added to sampleⁱⁱⁱ</i>	<i># of individuals invited^v</i>	<i># of individuals interviewed</i>	<i># of organizations represented in sample</i>
<i>Federal agencies</i>	14	2	1	36	21	9
<i>State agencies</i>	4	0	2	11	7	3
<i>Local agencies</i>	3	0	0	1 ^v	1	1
<i>Conservation districts and watershed councils</i>	15	5	0	16	11 ^{vi}	9
<i>Non-governmental organizations</i>	11	4	1	12	9 ^{vi}	8
<i>Academic</i>	2	1	0	1	0	0
Total	49	12	4	77	48	30

[i] Montana Drought Demonstration Partners. A Workplan for Drought Resilience in the Missouri Headwaters Basin: A National Demonstration Project; 2015. Available online: http://dnrc.mt.gov/divisions/water/management/docs/surface-water-studies/workplan_drought_resilience_missouri_headwaters.pdf

[ii] In consultation with the Montana demonstration project leadership, we eliminated organizations from the sample because (a) they were aggregate organizations already represented by their constituent parts, (b) because organizations listed on the initial workplan were no longer actively participating by the time of the interviews, (c) in the case of three watershed councils, out of concern about overburdening local staff, or (d) in the case of Montana State University, because of author's (McEvoy) affiliation and representation.

[iii] Organizations were added to the sample either because they were recommended by multiple interviewees as particularly knowledgeable about, or involved with, drought management in southwestern Montana (in the case of one federal agency and one NGO organization), or because project leadership indicated they had become project partners since the publication of the workplan (in the case of two state agencies).

[iv] Eight people referred the invitation to someone else, nine people declined the invitation (two were too busy; seven felt the topic was not relevant to their role), eight people did not respond after three email reminders, and three indicated a desire to participate but were unable to schedule an interview by the end of the study period.

[v] Despite significant efforts, we were not able to contact an appropriate person at the other two local agencies.

[vi] One person worked with both a watershed council and an NGO. This person is counted in both categories, but only once in the total. As a result, the total number of individuals interviewed and the number of declines do not add up as expected.

Table S2: Interview Protocolⁱ

1. What is your definition of drought, especially in the Montana context?
2. What is your role? In particular, what is your role related to making or supporting decision making about drought?
3. What outcome(s) or impact(s) of drought are you trying to address in managing your system? [If not managing: What outcomes(s) or impact(s) of drought are you particularly concerned about?]
4. There is often a distinction made between actions taken to prepare for a drought (i.e. things you do before one happens) and actions taken to respond to a drought (i.e. actions taken once a drought begins to cope with its impacts). <ul style="list-style-type: none"> a. What actions are you and/or your agency taking to prepare for drought? b. What actions have you and/or agency taken to respond to previous droughts?
5. What do you consider to be the best indicators of drought for your purposes? Why?
6. If you were going to invest in additional monitoring for drought for the Upper Missouri Headwaters, what would you say were the top two priorities?
7. How do you currently incorporate scientific studies or analysis into your decision making?
8. If you were going to invest in additional scientific research for drought preparedness for the Upper Missouri Headwaters, what would you say were the top two priorities? [If needed, prompt to distinguish research from monitoring]
9. To what extent do you view drought as a risk in this region?
10. To what extent do you believe that the landscapes that you manage and/or the larger socioeconomic system in which you operate have the capacity to respond to or prepare for drought?
11. How does the regulatory context affect your efforts to manage for drought?
12. Earlier we pointed out that there is often a distinction made between actions taken to prepare for a drought (i.e. things you do before one happens) and actions taken to respond to a drought (i.e. actions taken once a drought begins). With that in mind... <ul style="list-style-type: none"> a. Are there any specific factors that prevent you and/or your agency from preparing for droughts before they happen? b. Are there any specific factors that might prevent you and/or your agency from responding to drought?
13. There's currently a lot of discussion among NGOs, the EPA and even Army Corps of Engineers about using innovative strategies for dealing with water management. Some of these are called 'green-infrastructure' or 'nature-based strategies.' Basically, these terms mean addressing environmental management challenges in a way that benefits both humans and nature. <ul style="list-style-type: none"> a. Is this a concept that you've encountered in your work? If yes: <ul style="list-style-type: none"> b. Are you aware of any nature-based strategies that are being used in your area to specifically address drought? c. Are there factors you know of that would prevent or encourage the use of these nature-based strategies in your area? d. Are you aware of any other particularly innovative strategies for drought

preparedness?
14. Those were the questions I have for you. Is there anything else you want to tell me or anything else that seems important?

[i] Development of the interview protocol built on and/or adapted questions used in Ferguson, D. B., Masayeva, A., Meadow, A. M., & Crimmins, M. A. (2016). Rain gauges to range conditions: Collaborative development of a drought information system to support local decision-making. *Weather, Climate, and Society*, 8(4), 345-359; Cravens, A. E. (2018). *How and why Upper Colorado River Basin land, water, and fire managers choose to use drought tools (or not)* (No. 2018-1173). US Geological Survey; and McNeeley, S. M., Beeton, T. A., & Ojima, D. S. (2016). Drought risk and adaptation in the interior United States: Understanding the importance of local context for resource management in times of drought. *Weather, Climate, and Society*, 8(2), 147-161.

Table S3: Characteristics by interview

1. Interview Number	2. Type	3. Role in drought preparedness and response	4. Drought definition (drivers, impacts or both)	5. What kinds of impacts were mentioned in drought definition?	6. # of non-ecological drought impacts discussed in interview	7. # of ecological drought impacts discussed in interview	8. Assigned drought orientation ⁱ	9. Description of role mentioned climate change?	10. Included climate change or transformational drought in their definition of drought?	11. Components of drought exposure mentioned	12. Categories of adaptive capacity facilitators mentioned	13. Categories of adaptive capacity barriers mentioned ⁱⁱ
UMH2	federal	both	both	both	2	7	Type I	no	no	Land and water use, Landscape characteristics	--	Culture
UMH3	federal	both	both	both	12	13	Type III	no	no	Climate change, Landscape characteristics	Culture, Knowledge	NRM
UMH7	federal	both	impacts	both	12	19	Type I	yes	no	Climate change, Land and water use	Culture, Ecological	Ecological, Economic, Institutions
UMH10	federal	ecosystems	both	both	0	19	Type I	yes	yes	Climate change	Culture, Institutions	Culture, Economic, Institutions, Knowledge
UMH11	federal	both	impacts	both	1	6	Type I	yes	no	Climate change, Land and water use	Institutions, Other	Culture, Institutions
UMH12	federal	both	both	ecosystems	7	15	Type I	yes	no	Climate change, Landscape characteristics, Meteorological drought	Culture, Ecological	Ecological, Institutions
UMH13	federal	ecosystems	both	unspecified	2	13	Type I	no	no	Climate change, Land and water use, Meteorological drought	Culture, Economic	Culture, Ecological, Economic, Institutions
UMH14	federal	ecosystems	both	ecosystems	0	6	Type I	yes	no	Climate change	Culture, Institutions	--

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UMH17	federal	both	both	both	6	1	Type II	no	no	Land and water use, Landscape characteristics	Ecological	Economic, Knowledge
UMH18	federal	both	both	both	3	5	Type I	yes	no	Climate change, Land and water use, Meteorological drought	Economic, NRM	Economic, NRM
UMH19	federal	both	impacts	both	2	2	Type III	no	no	Climate change, Meteorological drought	Culture, Institutions	Culture, Ecological, Institutions
UMH28	federal	both	impacts	unspecified	10	1	Type II	no	yes	Land and water use	--	Culture, Ecological, Economic, Institutional
UMH29	federal	people	both	both	4	12	Type I	no	no	Meteorological drought	Institutions	Ecological, Other
UMH35	federal	both	both	both	3	7	Type I	no	no	Climate change, Landscape characteristics, Meteorological drought	Knowledge, NRM	Culture, Knowledge
UMH36	federal	both	both	both	1	6	Type I	yes	yes	Climate change, Meteorological drought	Culture, Institutions	Culture, Economic, Institutions
UMH38	federal	both	drivers	n/a	0	5	Type I	no	no	Land and water use, Meteorological drought	--	Culture, Institutions
UMH39	federal	both	both	ecosystems	4	9	Type I	no	no	Climate change, Meteorological drought	Culture, Institutions, NRM	Ecological, NRM

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UMH40	federal	people	both	people	3	2	Type II	no	no	Climate change, Meteorological drought	--	Economic
UMH43	federal	people	impacts	people	8	10	Type III	no	no	Climate change, Meteorological drought	Knowledge, NRM,	Economic, Institutions, NRM
UMH44	federal	both	both	both	1	9	Type I	no	no	Climate change, Land and water use	Culture, Institutional	Culture, Ecological, Institutions
UMH1	NGO	both	both	both	1	16	Type I	yes	no	Climate change, Land and water use, Landscape characteristics, Meteorological drought	Ecological	Ecological, Other
UMH4	NGO	ecosystems	drivers	n/a	9	10	Type III	yes	no	Land and water use, Landscape characteristics	Culture, Economic, Knowledge	--
UMH5	NGO	both	impacts	people	10	8	Type III	no	no	Climate change, Land and water use	Culture	Culture
UMH8	NGO	both	impacts	people	9	6	Type II	yes	yes	Climate change, Land and water use, Landscape characteristics	Institutions	Culture, Institutions, Knowledge
UMH9	NGO	both	both	unspecified	7	8	Type III	yes	no	Climate change, Landscape characteristics	Economic	--
UMH16	NGO	both	both	both	4	9	Type I	no	no	Climate change, Land and water use	Culture, Economic	Economic, Institutions

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UMH21	NGO	both	both	both	11	2	Type II	no	yes	Climate change, Land and water use, Landscape characteristics	Culture, Institutions	Economic, Institutions
UMH24	NGO	both	both	ecosystems	9	16	Type I	no	no	Climate change, Land and water use, Landscape characteristics	--	Cultural, Economic
UMH25	NGO	both	both	unspecified	4	7	Type I	no	no	Climate change, Land and water use, Meteorological drought	Culture, Institutions	Economic, Institutions
UMH6	state	both	both	both	4	4	Type III	no	yes	Land and water use	Culture, Institutions, Knowledge	Culture, Institutions
UMH20	state	both	both	both	2	5	Type I	no	yes	Land and water use, Landscape characteristics	--	Culture, Economic
UMH26	state	both	both	ecosystems	0	11	Type I	no	no	Climate change, Land and water use, Landscape characteristics	Economic	Economic
UMH33	state	both	both	ecosystems	4	2	Type II	yes	no	Climate change, Land and water use, Meteorological drought	Culture, Institutions	Economic, Institutions
UMH34	state	both	impacts	both	2	6	Type I	no	no	Climate change, Land and water use, Meteorological drought	--	Economic, Knowledge, NRM

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UMH37	state	both	drivers	n/a	7	4	Type II	no	no	Climate change, Land and water use, Meteorological drought	--	Culture
UMH15	watershed / local	both	impacts	both	6	3	Type II	no	no	Climate change, Land and water use, Landscape characteristics	Institutions	NRM
UMH22	watershed / local	both	both	people	1	4	Type I	no	no	Climate change, Meteorological drought, Land and water use	--	Economic, Institutions, NRM
UMH23	watershed / local	both	both	unspecified	8	2	Type II	no	yes	Climate change, Land and water use, Landscape characteristics	Institutions	Culture, Economic, Institutions
UMH27	watershed / local	both	impacts	both	9	1	Type II	no	no	Landscape characteristics, Meteorological drought	Culture, Economic	NRM
UMH30	watershed / local	both	impacts	unspecified	5	2	Type II	no	no	Climate change, Land and water use, Meteorological drought	Institutions, Knowledge	Institutions, NRM
UMH31	watershed / local	both	both	both	8	5	Type II	no	no	Climate change, Land and water use, Landscape characteristics	--	Culture, Economic, Institutions
UMH32	watershed / local	both	both	both	9	0	Type II	no	no	Climate change, Land and water use	--	Culture, Economic

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UMH41	watershed / local	people	both	people	4	1	Type II	no	no	Climate change, Landscape characteristics, Meteorological drought	Institutions, NRM	--
UMH42	watershed / local	both	both	both	7	4	Type II	yes	yes	Climate change	NRM	Culture, Institutions

[i] Type I = perceiving impacts to natural system. Type II = perceiving impacts to human system. Type III = perceiving impacts to both systems.

[ii] NRM = Past natural resource management.