

What's New in Drought Impacts

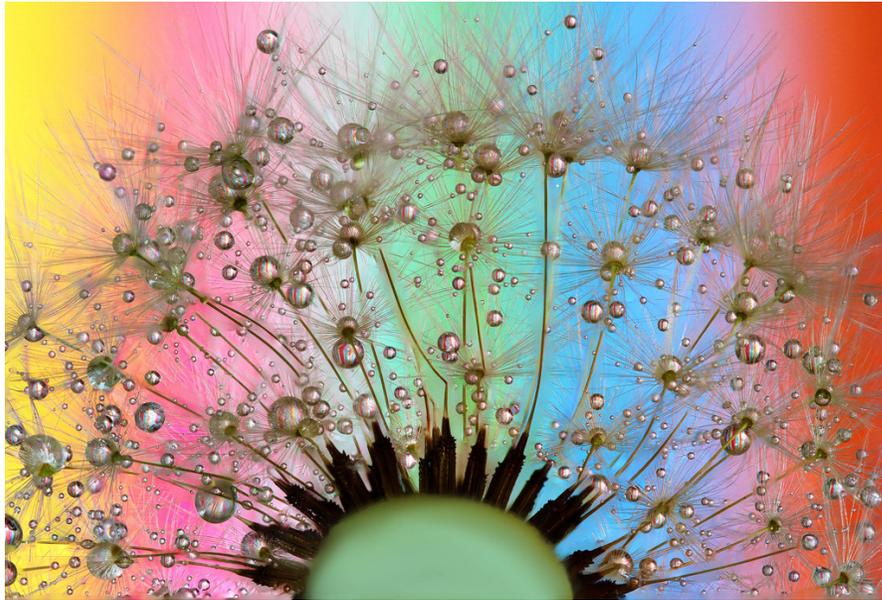
KELLY HELM SMITH, NATIONAL DROUGHT MITIGATION CENTER

CA-NV & MIDWEST DROUGHT EARLY WARNING SYSTEM WORKSHOPS

NOVEMBER 19, 2019, SACRAMENTO, CA, & ST. PAUL, MN



Q: What is drought?



<http://121clicks.com/gallery-category/nature-subtle>

“... a condition relative to some long-term average condition of balance between rainfall and evapotranspiration in a particular area, a condition often perceived as ‘normal.’” -- Wilhite and Glantz, 1985

“... insufficient water to meet needs. ... In essence, as with rainbows, each person experiences their own drought.” – Kelly Redmond, BAMS, 2002

“Drought is an experience, not an event.” – Stu Foster, Kentucky State Climatologist, USDM Forum, 2019

Why track drought impacts?

RESPONSE & RECOVERY: TO KNOW WHERE TO DIRECT RELIEF

RESEARCH: UNDERSTAND OF HOW PHYSICAL EVENTS SUCH AS PRECIPITATION AND TEMPERATURE AFFECT THE ENVIRONMENT AND SOCIETY ... NEED TIME SERIES DATA.

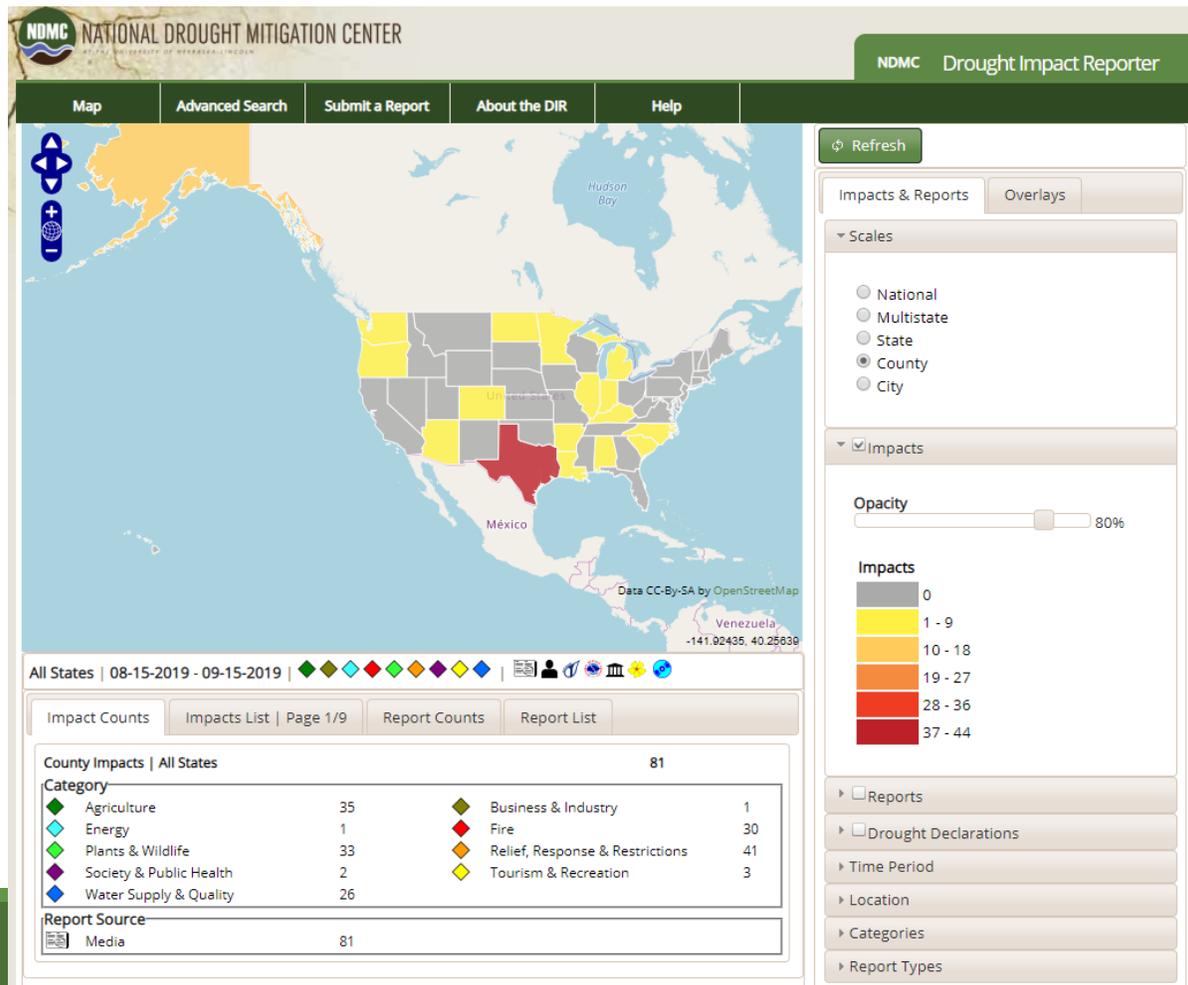
PLANNING: IMPACTS POINT TO UNDERLYING VULNERABILITY.

TRACKING DROUGHT IMPACTS CAN HELP DECISION MAKERS FIGURE OUT WHERE TO FOCUS EFFORTS TO REDUCE VULNERABILITY TO THE NEXT DROUGHT.



Drought Impact Reporter

<https://droughtreporter.unl.edu>



Defines drought impacts as “an observable loss or change at a specific place and time due to drought.”

Mainly based on media reports. A database of events, searchable by scale, place, time, sector.

Resource for drought historians, planners doing vulnerability analysis.

Impacts include attribution – we know drought caused it.

Using media’s agenda-setting function to ID impacts that matter.

Can’t recreate it by googling.

When to count the news vs when to read it

- Impact Reporter is a database of historic events, comparable to EM-DAT
- No consistent units
- Various scales and perspectives

Next step: “Dig here” for data on underlying trends and vulnerabilities.

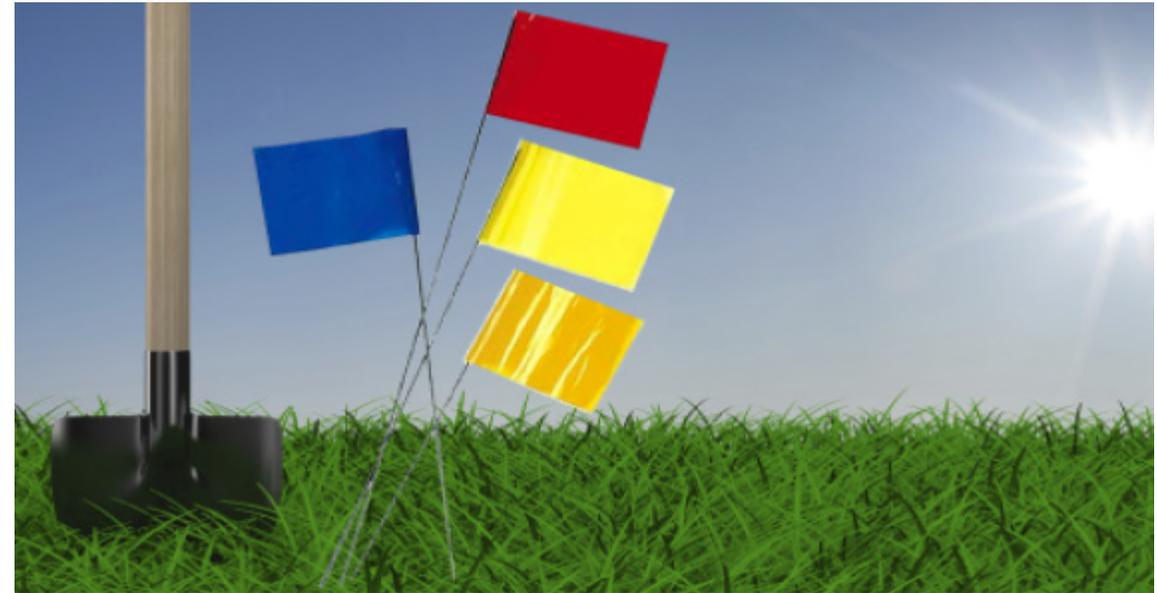


Image courtesy of Muscatine Power and Water
<https://www.mpw.org/news-events/news/tips-from-the-pros/the-flags-and-paint-mean>

Evolution of the Drought Impact Reporter to larger context

Events database

Condition monitoring

Links to official data

Post-drought reports

2015 Drought Response Summary Report

March 2016
Publication no. 16-11-001

Crowdsourcing:
Local knowledge
Spatially dispersed
(Experiential)

50 states, many agencies – what exists?

May be systematically collected within state

Decision-makers' needs

Archive

<https://mydrywatersupply.water.ca.gov/report/publicpage>

Drought Impacts Toolkit

Home

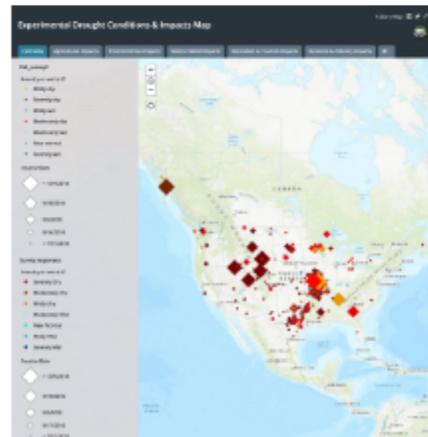
Condition Monitoring Observations

Drought Impact Reporter



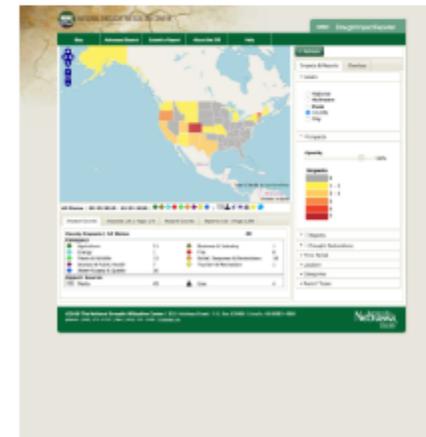
CONDITION MONITORING OBSERVATIONS

Different systems collect condition monitoring observations using a common seven-point dry-to-wet scale to capture what they see at a specific place and time.



DROUGHT IMPACT REPORTER

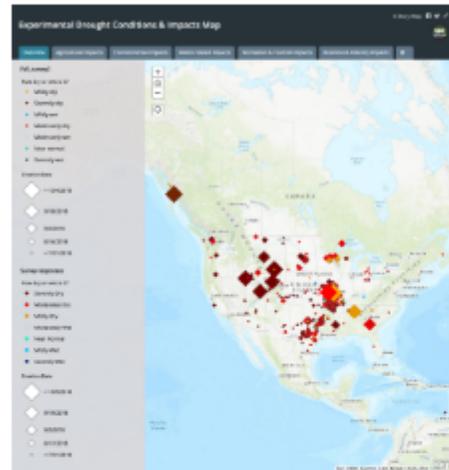
We systematically scan news stories, looking for "a loss or change at a specific place and time due to drought," providing a preliminary historic record and sometimes insight on emerging conditions.



DroughtImpacts.unl.edu

Condition Monitoring Observations

Submit and view observations



The Drought Impacts Toolkit condition monitoring form allows anyone to submit a report and photo.

[Submit a Report](#)

[2019 Map](#)

[2018 Archive](#)

[Download Factsheet](#)

Explore CoCoRaHS



CoCoRaHS observers sign up through the Community Collaborative Rain, Hail & Snow Network, measure record precipitation every day, and benefit from lively educational support.

[Go To CoCoRaHS](#)

When soliciting observations ...

- Don't make it too hard. Just ask people what they are seeing or experiencing. Asking them whether it's because of drought (attribution) can be harder (Meadow et al. 2013).
- Ask for a quantitative measurement that can be verified or cross-checked.
- Compare “crowd” observations with “expert” observations.
- Letting observers know how their observations are being used helps sustain ***motivation*** (Lackstrom et al. 2013). This will be much easier if observations relate to an information need. Users could include:
 - Scientific researchers
 - State decision-makers
 - U.S. Drought Monitor authors
 - Others

VGIS: Why do people volunteer?

- Keepers: *protect the environment, safety, livelihood*
- Builders
- Adventurers: *discovery, learning, new experience*
- Freelancers
- Achievers
- Socializers
- Altruists
- Profit-Chasers

Gómez-Barrón et al. 2019

PPGIS: Do different motives introduce bias?

Different stakeholders, different interests, i.e., timber production or forest-based recreation

Brown et al. 2014

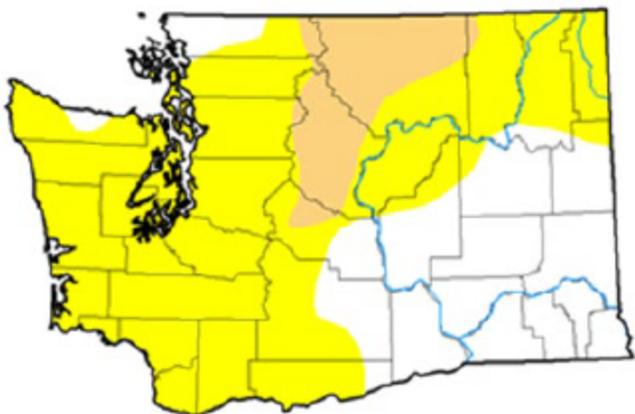
Introduction

Report drought-related conditions and impacts within the U.S. This is a nation-wide service provided by the National Drought Mitigation Center, based at the University of Nebraska, in partnership with the National Integrated Drought Information System. Information submitted by this form appears on [this map](#). Please note that this form is not part of the process to apply for assistance.

Water Resources Program



Drought – Report the impact



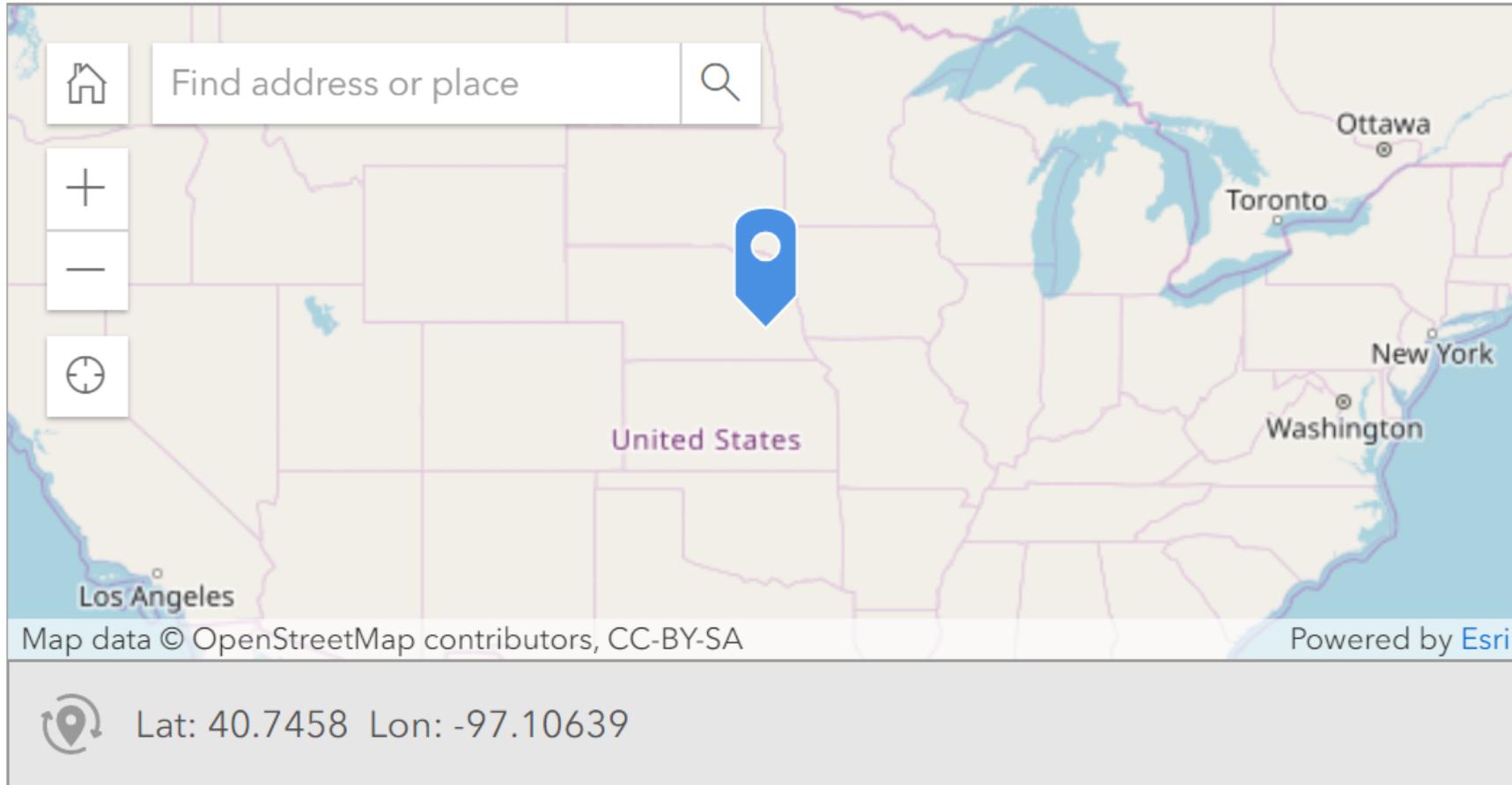
Is drought affecting you?

Washington State is working with the National Drought Mitigation Center and others to collect crowd-sourced information on the effects of drought.

We want to know how drought is affecting you. An online reporting form – the Drought Impact Reporter – is available for you to submit your observations.

Where are you?*

Position the marker on the map for your location using one of three methods: 1) Click on the round compass icon and allow access to your location. 2) Enter an address or the name of a place in the search window. 3) Drag the map until the marker points to the correct location. *Use the plus or minus if you want to zoom in or out after you have placed the marker. Scrolling will move the marker.*



Select your jurisdiction: ▼

Select a state/territory:

This will help us spot wrong locations but does not position your report correctly on the map. Use the marker on the map above to make sure your report shows up in the right place.

-Please Select-



Select a local jurisdiction:

This will help us spot wrong locations but does not position your report correctly on the map. Use the marker on the map above to make sure your report shows up in the right place.

-Please Select-



What is the date?

Please use the calendar to select the date of your observation, if it is other than today.

 9/15/19

How dry or wet is it?*

Please use what you know about your part of the country and base your observation on what is normal for this time of year. A normal dry season is not the same as drought.

Severely Dry: There is no soil moisture. Ponds, lakes, streams and wells may be nearly empty or dry. Producers may have crop or pasture losses. Mandatory water restrictions may be in place.

Moderately Dry: Plants may be brown due to dry conditions. Streams, reservoirs or well water levels may be low. Voluntary water use restrictions may be in place. There may be water shortages. Plants, crops or pastures may be stressed. Soil is dry.

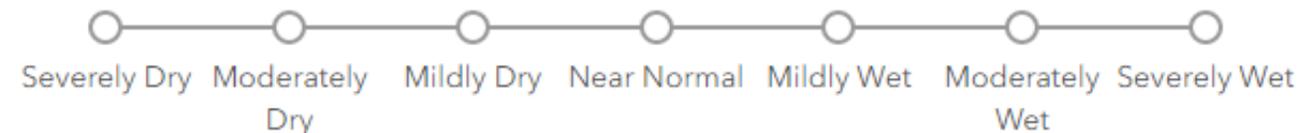
Mildly Dry: Growth may have slowed for plants, crops or pastures. Soil is somewhat dry. Local plants, pastures or crops may not have fully recovered if conditions are changing from drier to wetter.

Near Normal: What you're seeing is what you expect for this time of year.

Mildly Wet: Local plants, crops or pastures are healthy, recovering from dry conditions or draining from wet conditions. Soil moisture is above normal.

Moderately Wet: Local plants, crops or pastures are healthy and lush. Soil is very damp and the ground may be saturated with water. There may be standing water in low areas and ditches. Water bodies may be fuller than normal.

Severely Wet: Water levels in lakes, streams and ponds are well above normal. Standing water covers some areas that are normally dry. Soil is wet and ground is completely saturated. There may be flooding.



- Report crop production impact ▶
- Report livestock production impact ▶
- Report domestic or municipal water supply impact ▶
- Report habitat for wildlife or fish impact ▶
- Report recreation & tourism impact ▶
- Report other business & industry impact ▶
- Report public and community health impact ▶
- Report fire impact ▶

See draft of sectors and impacts for 2020 edition.

Report crop production impact ▼

Crop production

Please use the check boxes to tell us what effects of drought you have experienced and what actions you have taken.

Decrease in water allocation

Reduced yield

Insect infestation

Crop disease

Plant stress

Added well, dam, pipe, etc.

Increased irrigation

Upload photo

You can upload a photo of up to 10 MB, if you are the photographer or have permission to share the photo. It will be visible on the web. Please be sure to use the description field below for credit and caption information: Who took the photo, what is the location, what is the date, and what is it showing us? By uploading the photo, you agree that it may be used and shared for educational and management purposes.

Press here to choose image file. (<10MB)



Description and/or caption information

Did you upload a photo? If so please tell us how we should credit the photo, and what it is showing us.

Please provide any other description that will help us understand the drought impact or conditions that you checked, for example: What kind of crops do you grow? What kind of animals do you raise? Do you rely on your own well or are you part of a municipal system?

1000

Your name

This is optional and will not be published. It would be helpful in case we need to contact you for more information.

Your organization

This is optional and will not be published. It would be helpful in case we need to contact you for more information.

Your email

This is optional and will not be published. It would be helpful in case we need to contact you for more information.

Submit

Survey 2019

Overview

Crop Production

Livestock Production

Water Supply

Habitat

Recreation and Tourism

Business and Industry

Public Health

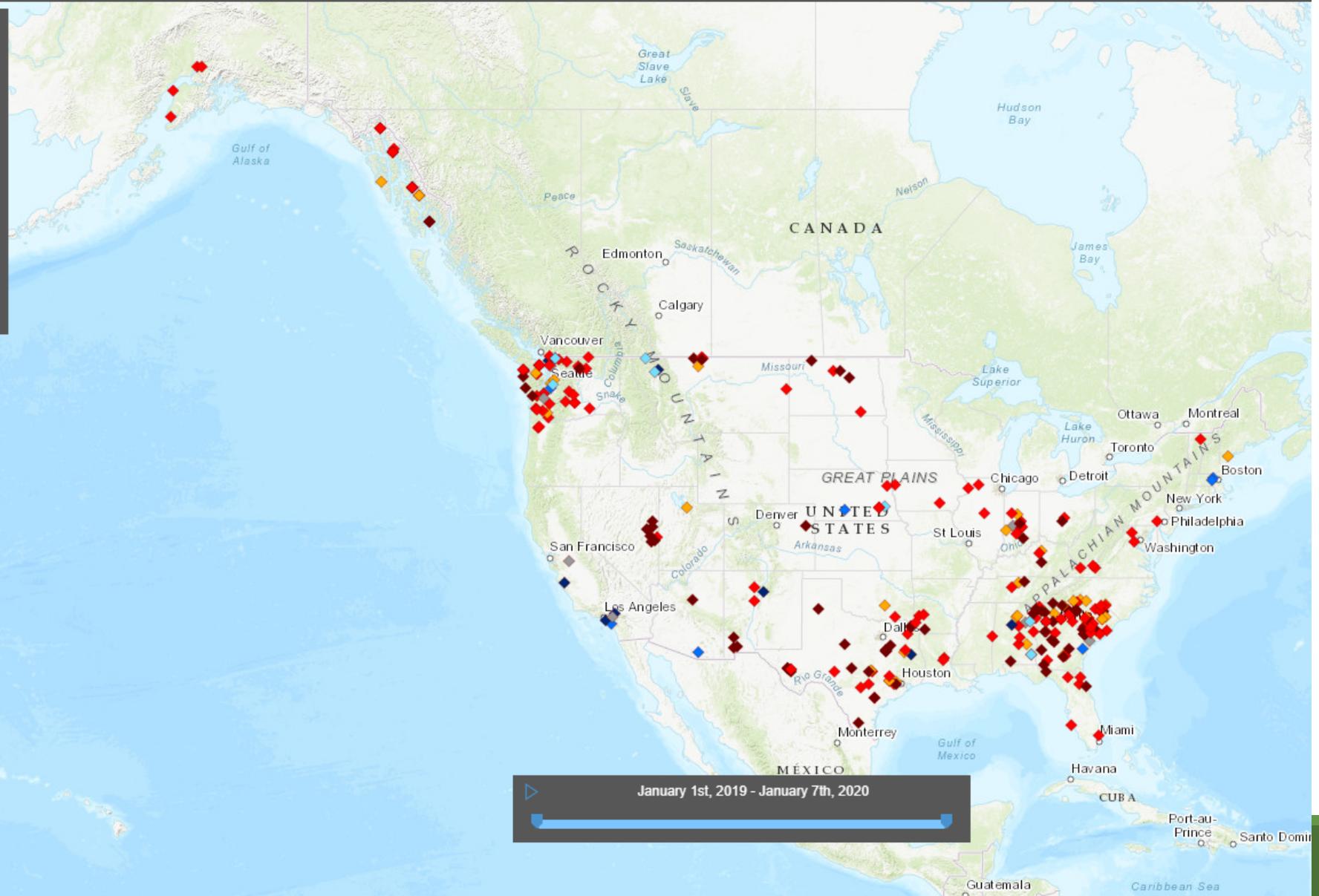
Fire

Photos

Overview

Overview

- ◆ Severely Dry
- ◆ Moderately Dry
- ◆ Mildly Dry
- ◆ Near Normal
- ◆ Mildly Wet
- ◆ Moderately Wet
- ◆ Severely Wet



Survey 2019

Overview

Overview-Clustered

Crop Production

Livestock Production

Water Supply

Wildlife/Fish Habitat

Recreation and Tourism

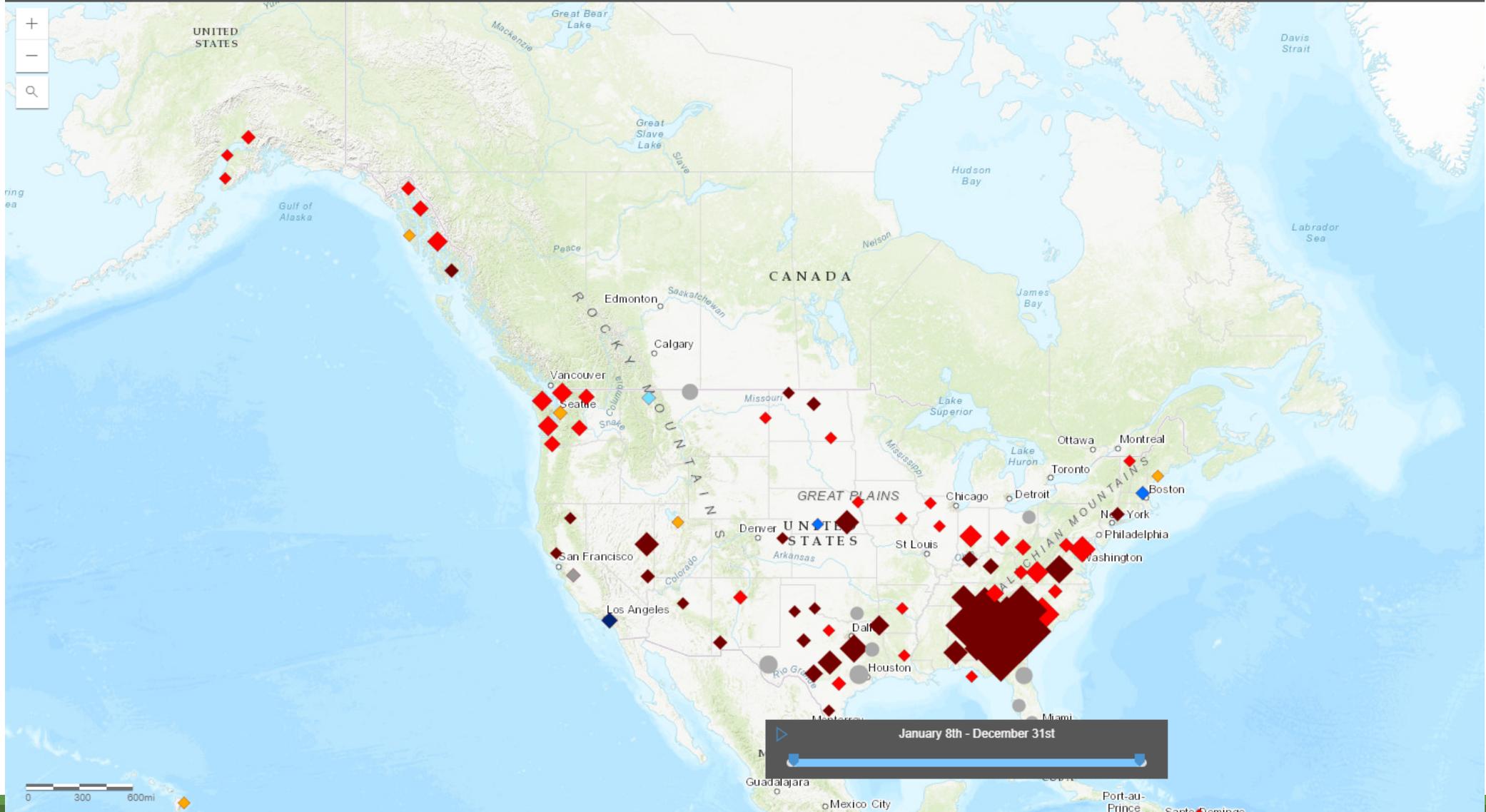
Business and Industry

Public Health

Fire

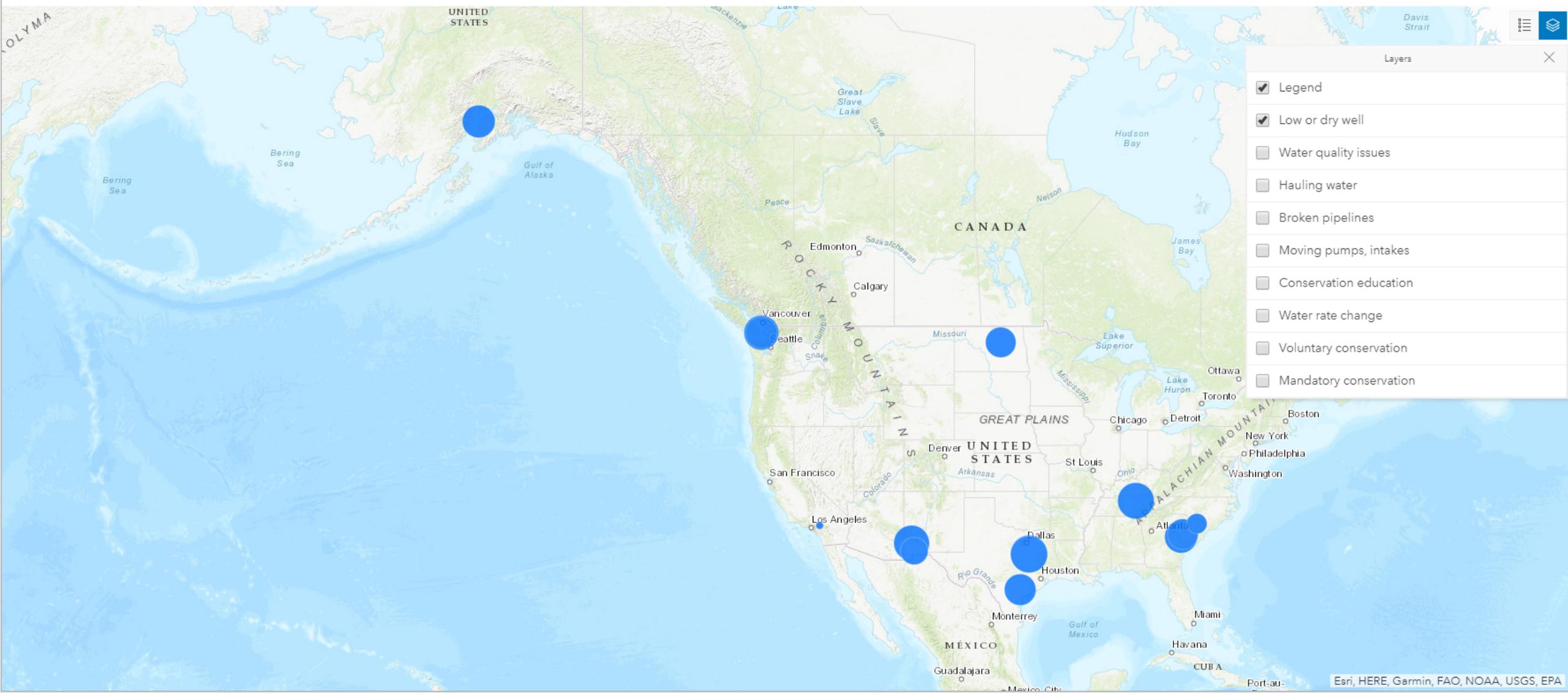
Photos

Overview Tab-Time Aware-Clustered



- Overview
- Crop Production
- Livestock Production
- Water Supply**
- Habitat
- Recreation and Tourism
- Business and Industry
- Public Health
- Fire
- Photos

Please use the drop down menu on the right side of the map to see the legend or to filter impacts.



Esri, HERE, Garmin, FAO, NOAA, USGS, EPA



Livestock Production Overview

Reduced pasture, forage

Decreased stock weights

Animal stress

Mortality

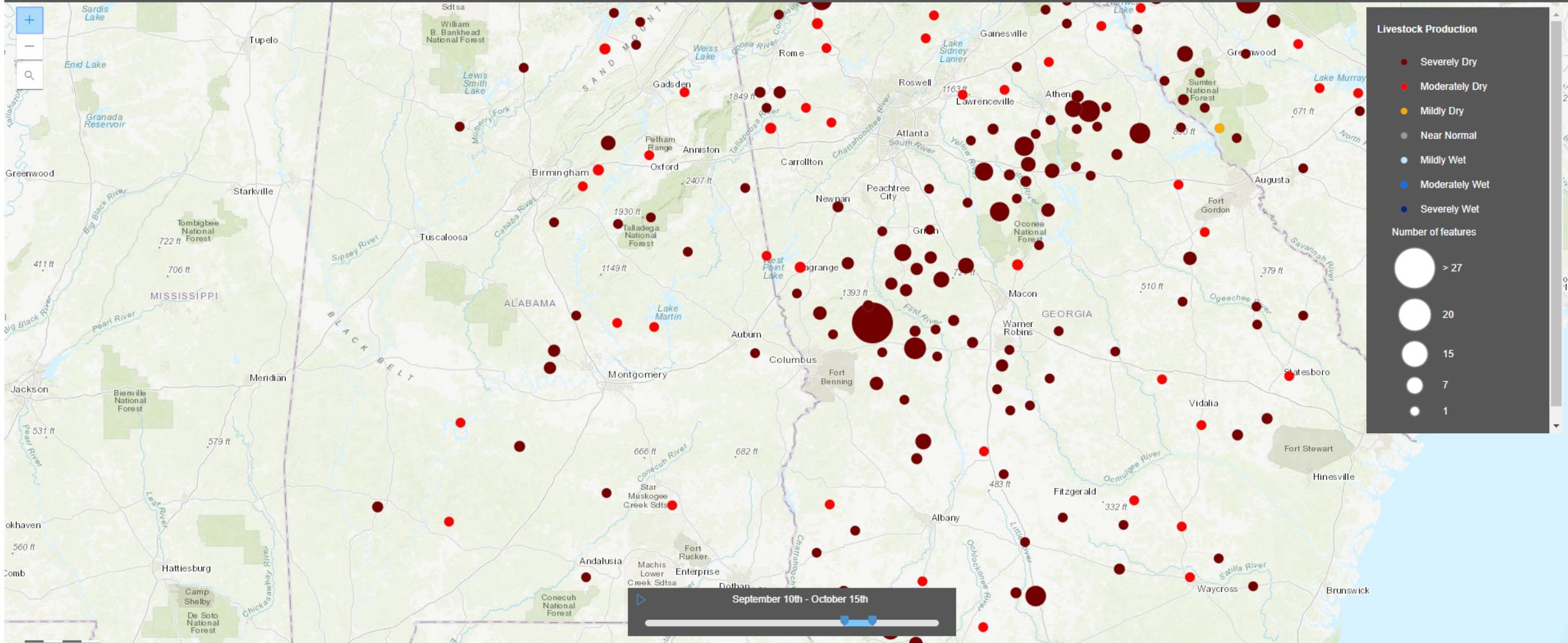
Reduced grazing on public lands

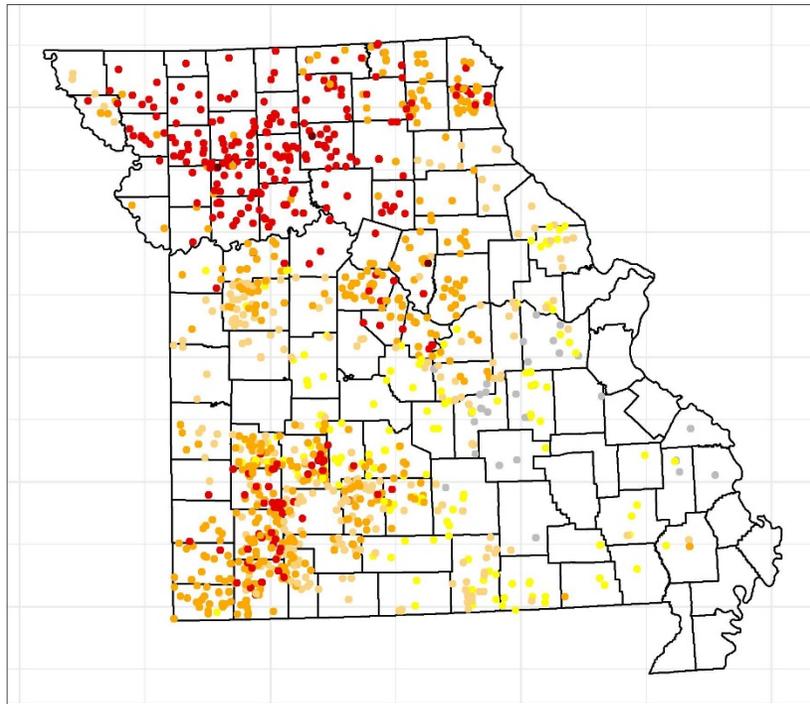
Hauled water

Sold livestock

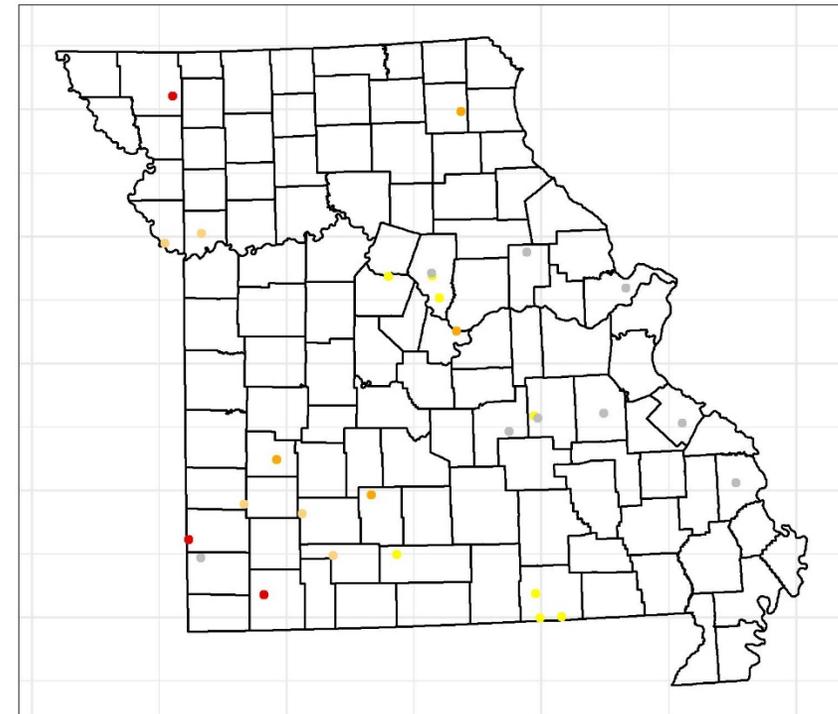
Livestock Sector

Share

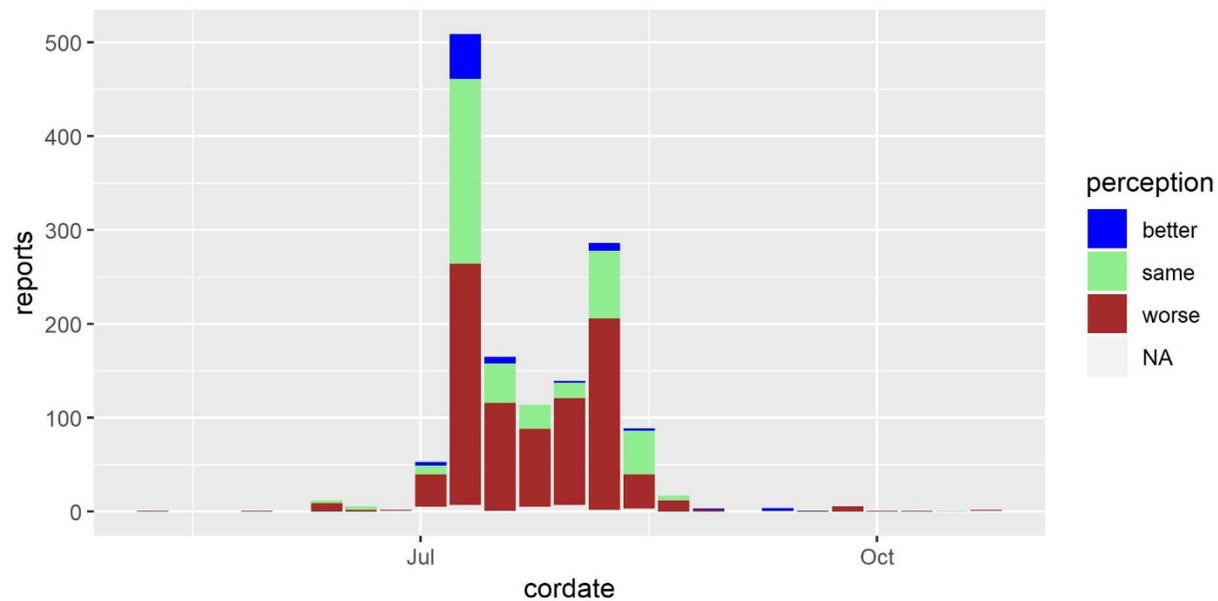




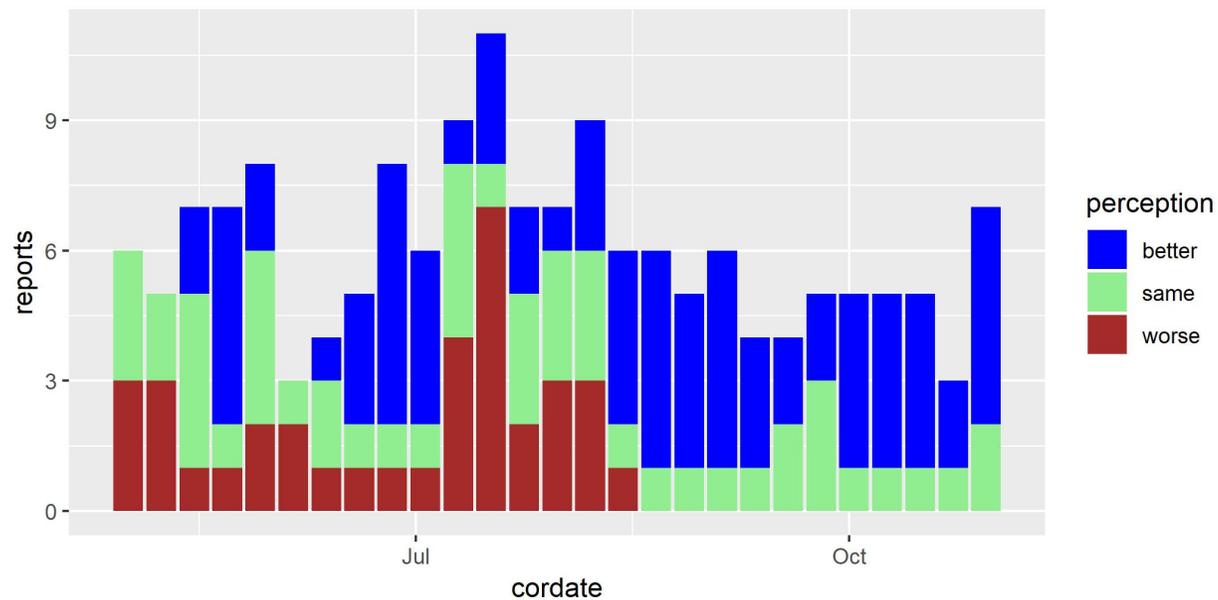
This map shows the 1,320 different locations for which reports were submitted directly to the DIR, with point color indicating USDM status at the time of the report. The most reports submitted for any of the points from the DIR form was 5.



This map shows the 29 different locations for which reports were submitted via CoCoRaHS, with point color indicating USDM status at the time of the report. The number of reports per point ranged from 1 to more than 25.



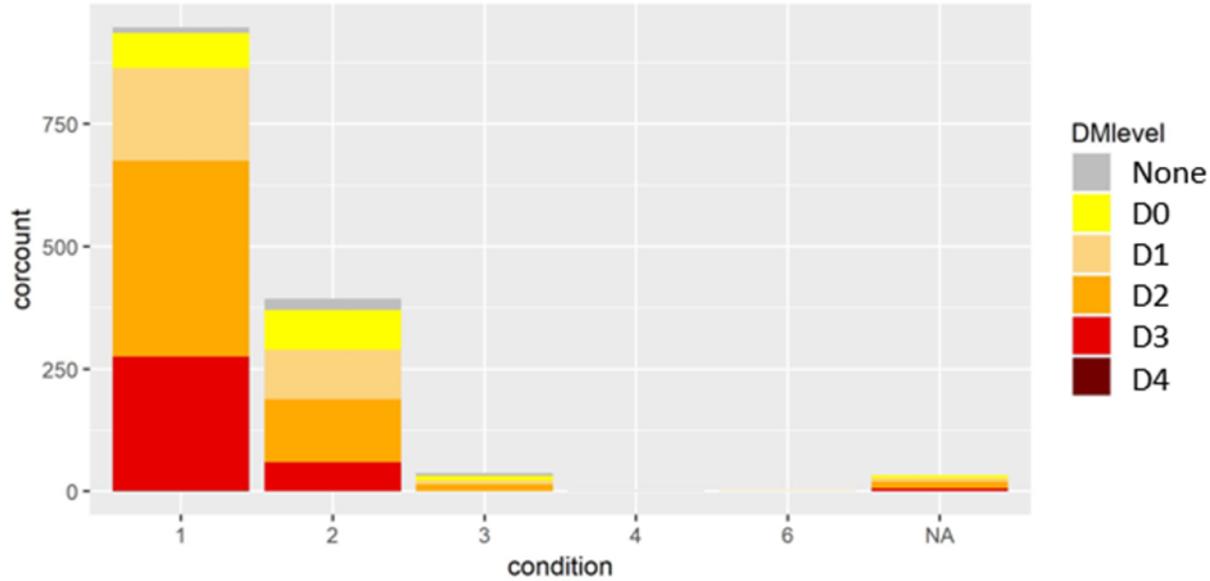
DIR reports were more clustered in time, and more focused on the dry side.



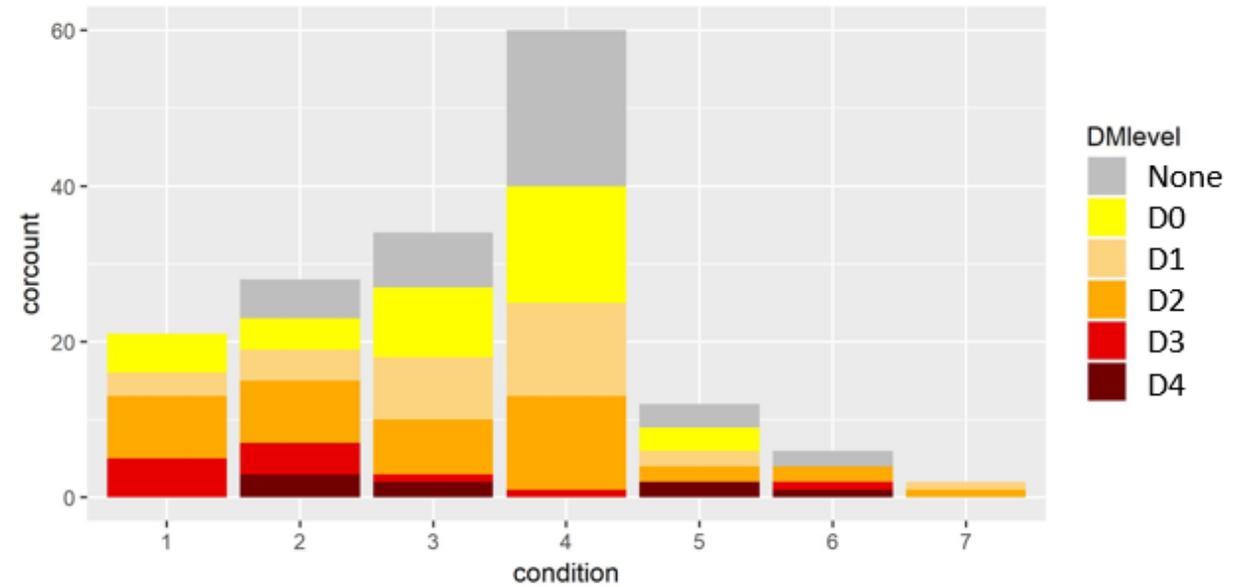
CoCoRaHS reports were nicely spread over time. Reports saying conditions were worse than USDM status were clearly clustered in the first part of the growing season.

Reported dryness vs. USDM level

DIR



CoCoRaHS



	DIR							CoCoRaHS			
DMlevel	cowks	propwks	obs	expobs	diff	diff^2/ex pobs	obs	expobs	diff	diff^2/ex pobs	
None	823	0.265056	40	374.7897	-334.79	299.0588	37	43.20419	-6.20419	0.890931	
D0	720	0.231884	168	327.8841	-159.884	77.96327	36	37.7971	-1.7971	0.085445	
D1	730	0.235105	309	332.438	-23.438	1.652458	30	38.32206	-8.32206	1.807228	
D2	471	0.151691	555	214.4908	340.5092	540.5663	40	24.7256	15.2744	9.435854	
D3	273	0.087923	339	124.3227	214.6773	370.6993	12	14.3314	-2.3314	0.379267	
D4	88	0.028341	3	40.07472	-37.0747	34.2993	8	4.619646	3.380354	2.473522	
	3105	1	1414	1414		1324.239	163	163		15.07225	
df = Dmlevels - 1			Chisquare 1,324, df = 5, p < .001				Chisquare = 15.07, df = 5, p < .02				

“ ... we were experiencing some pretty severe impacts in localized areas throughout the state beginning as early as May 2018. Without the impact reporter, these localized impacts would likely not have been on our radar – these reports helped us give valuable information to planners throughout the state.”

-- Jennifer Hoggatt, director, Missouri Water Resources Center

Missouri observers survey results

Willing to report regularly?	count	percent
yes, every month, year-round	71	31
yes, weekly or monthly in some seasons	42	18
yes, every week, year-round	40	18
maybe, it depends	39	17
no	36	16

67%

Q: Who should sustain the effort?

New for 2020

1. How much experience do you have with conditions there?
 - a. less than 5 years
 - b. 5-10 years
 - c. 10-20 years
 - d. 20 or more years
2. How many times in the past have you seen it like this?
 - a. Never
 - b. Once
 - i. When was it like this in the past? dropdown, years 2000-2019
 - c. Twice or more
 - i. When was it most recently like this? dropdown, years 2000-2019

Sectors for 2020

- Crop production
- Livestock production
- Municipal water supply
- Community hydropower
- Public health
- Household
- Recreation & tourism
- Other business & industry
- Fire
- Forestry
- Wildlife habitat
- Freshwater fish
- Spawning fish



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e | ndmc@unl.edu

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 @droughtcenter

Kelly Helm Smith
ksmith2@unl.edu
402-472-3373
[@khelmsmith](#)

Crop production

Less water for irrigation

Reduced yield

Insect infestation

Crop disease

Plant stress

Added well, dam, pipe, etc.

Increased irrigation

Erosion

Other, please describe _____

Livestock production

Reduced pasture, forage

More invasive species (plants)

Decreased stock weights

Animal stress

Mortality

Reduced grazing on public lands

Hauled water

Sold livestock

Erosion

Other, please describe _____

Municipal water supply

Low or dry well

Water quality issues

Hauling water

Broken pipelines

Moving pumps, intakes

Conservation education

Water rate change

Voluntary conservation

Mandatory conservation

Other, please describe _____

Community hydropower

Reduced water for hydropower (five-point scale)

water conservation to mitigate impacts

0-25% power from diesel

25-50% power from diesel

50-100% power from diesel

100% diesel

generator issues

Other, please describe _____

Public health

Air quality, dust, pollen

More vector-borne disease

Special meetings or activities held

Ceremonies or festivals cancelled

Less food for subsistence

Garden needs more water or yields less

People relocating

Stress

Increased algal blooms

Other, please describe _____

Household

Reduced outdoor water use

Reduced indoor water use

Increased lawn, landscape watering

Dry lawn

Cracked foundation

Increased power bill

Increased use of cistern, rainwater

Low or dry well

Install graywater system

Change landscaping

Other, please describe _____

Recreation & tourism

Park or lake closed

Reduced boating, rafting

Less-appealing landscape

Hunting or fishing reduced

Ski season shorter

Snow making

Less back-country skiing

Reduced lift-ticket sales, visits

Other, please describe _____

Other business & industry

Landscaping business down

Lawn implement sales down

Barge traffic curtailed

Reduced sales

Reduced production due to lack of water

Reduced workforce

Closed business or bankruptcy

More golf course irrigation

Other, please describe _____

Fire

More fires than usual

More intense fires

More fire risk

Property damage

Smoke from distant fire

Park or road closure

Burn or fireworks bans

Firefighter settlements

Other, please describe _____

Forestry

Change in timing of plant growth

No new season growth (no new buds)

Leaves discolored, shriveled, burnt

Dead branch tips and/or dead top

Leaf drop or sparse canopy

Needle drop or sparse canopy

Excessive cone production

Dead trees

Fewer saplings or reduced survival

Reduced diameter growth
(compressed rings)

Change in fruit, nut, berry
production

More pests, diseases

More invasive species

Other, please describe

Wildlife habitat

Less food

Less water

Invasive plant or animal species

Wildlife disease or mortality

Change in animal migration

Wildlife foraging near people

Water quality reduced

Change in wetland, bog, swamp

Other, please describe _____

Freshwater fish

Less food

Reduced streamflow

Warmer water temperatures

Water quality change

Fish disease or mortality

Reduced fishery production

Other, please describe _____

Spawning fish

low streamflow

higher water temperature

hatchery moving fish earlier to salt water

fish mortality

timing of migration changed

no fish migration

isolated pools with rearing fish

poor fish runs

Other, please describe _____

References

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- Wilhite, D. A., and M. H. Glantz, 1985: Understanding: the Drought Phenomenon: The Role of Definitions. *Water International*, **10**, 111–120, <https://doi.org/10.1080/02508068508686328>.