National Listening Session Series Key Takeaways and Next Steps: Drought Prediction and Water Availability

Questions and Answers

	Question	Answer
1	Do you suggest any specific hydrologic model which would be best for drought predictions?	Ensemble predictions from multiple models are likely most useful given that each model has advantages and drawbacks. With respect to hydrologic drought prediction, the U.S. Geological Survey (USGS) is specifically focusing on (i) machine learning methods for predicting streamflow and groundwater drought onset, duration, and severity in an early warning forecasting capacity, and (ii) continuing to advance hydrologic modeling capacity to assess various climate, land use, and societal scenarios to better understand drought propagation and impacts. We will be sure to announce any products when they become available.
2	Can you comment on the connections between droughts, water shortages, and increases in wildfire frequency?	This is an important and complicated topic. Within the USGS Water Resources Mission Area we are beginning to evaluate drought effects on water use. The USGS Climate Adaptation Science Centers, Wildfire Community of Practice, and Ecosystems Missions Area also look closely at wildfire frequency. There are also a number of interagency and multisector working groups on this complex and interrelated topic.
3	Is there a methodology to track the effectiveness of a floodplain to trigger alarms, when necessary to protect folks that are downstream of a floodplain that may not be behaving as planned?	Changes in floodplains are a topic of interest to many agencies. Although this specific area is outside the scope of the drought prediction work for this session, if there is interest in follow-up on this topic, please reach out to the USGS to connect with a subject matter expert on this topic.

4	Is there a methodology that could predict better water use budgeting in times of drought for more efficient and equitable distribution?	Models are being developed and evaluated to estimate water use in situations that include climate change.
5	Is there a way to trigger alarms that moving to groundwater storage, as opposed to surface water storage, during droughts is highly recommended?	The tools under development for drought prediction will be designed with water managers in mind that would allow for more informed decision making under periods of drought. The NIDIS Drought Early Warning Systems (DEWS) also provide communities and support for regional decision makers.
6	Is there a way to sound alarms on long periods of drought, when a heavy rain event may trigger erosion/deposition/debris flow events?	One goal of drought prediction is to include estimates of the duration of drought, which could be used by other models and agencies to inform additional hazard events.
7	NOAA's Climate Prediction Center has a database of observed and forecast soil moisture values useful for agriculture. But their graphing is from the 1980s, and it is difficult to impossible in access the data behind the graphs for download into local reporting/analytic/graphing systems.	Thank you for that feedback. We will be sure to share your concerns with NOAA's Climate Prediction Center. We know they have been starting to update their mapping formats to reflect current standards and to be more easy to interpret and use. Certainly it is their priority to make this information accessible to users.
8	Would be great to have more cooperation between NIDIS, NOAA, Climate Engine, and Climate Toolbox for products. Need integration of data sources to get better use of VIC, SPEI, EDDI.	Thank you for this suggestion. It is something NIDIS has heard from other stakeholders and we are increasingly emphasizing this. We currently do integrate data sources from both Climate Engine and the Climate Toolbox on Drought.gov. The PDSI map that we display on the current conditions page is from Climate Engine, and we are working on using Climate Engine to pull in various indicators (SPI, SPEI, EDDI) using the new nClimGrid-Daily dataset (in progress). We use data from the Climate Toolbox on all of our local pages (for example Seattle, WA); it is the source of the data for the bar graph of drought indicators.

9	Useful for moving policy forward to address climate change if NIDIS could assign dollar values to climate impacts.	Thank you for that suggestion. Just a clarification that NIDIS mission is focused on drought, which can overlap with climate change, but climate change includes a much broader array of conditions (flooding, increased storm surges, etc.)
10	I saw that more monitoring/better monitoring is a must for most. What does the panel think is the biggest limitation to achieving this?	Both USGS and NIDIS continue to believe that on-the-ground monitoring systems are a critical component of better hydrologic drought analysis, and that such systems will continue to be needed to compliment/calibrate/validate both modeled and remotely-sensed data. One of the critical limitations (as is often the case) are the resources needed not only to install but, equally importantly, to maintain these systems. Stakeholder advocacy for these types of systems can help alert Congress and the Administration to their importance. One exciting example of a new approach to hydrological monitoring is the USGS Next Generation Water Observing System program. NGWOS integrates fixed and mobile monitoring assets in the water, ground, and air, including innovative webcams and new ground- and space-based sensors, providing a vision for exactly the kind of integrated information that participants in this listening session have emphasized.
11	At Lake Oswego, we have installed weather stations that measure temp, humidity, precipitation, soil temperature, moisture, and calculates ET. Would that be a benefit to you going forward?	Yes, NIDIS is interested in engaging with state- and local-level mesonets. Please feel free to contact us at: drought.portal@noaa.gov, and we can carry forward this opportunity. Thank you!
12	How does the USGS drought prediction project relate to the National Water Center water model efforts?	The USGS is developing machine learning models for predicting streamflow and groundwater drought onset, duration, and severity in an early warning capacity. We are evaluating our model results in comparison to existing model outputs from the National Water Model and the National Hydrologic Model. And we are in communication with the National Water Center on ways we can augment prediction work to meet the goals of each agency to serve stakeholder needs.

		More generally, NOAA and USGS have an established interagency forum to coordinate complementary work on hydroclimatology. For example, NOAA and the USGS are working closely to develop a Next Generation Water Resources Modeling framework that will facilitate model interoperability and multi-model approaches, collaboration, and scientific evaluation.
13	So what are we to make of NOAA's Drought Monitor scale as presented on their website? No drought Abnormally Dry Moderate Drought Severe Drought Extreme Drought Exceptional Drought If you start the scale by telling the public that your area is "Abnormally Dry," that would seem to already raise alarm bells. But is that better or worse than "Moderate Drought?" And if your area is already in 'Severe Drought," how much worse can "Exceptional Drought" be?	We should note that while NIDIS reports on the Drought Monitor, we are not involved in its development; it is a product of the USDA, NOAA, and the National Drought Mitigation Center (not a part of NIDIS). Svoboda et al. (2002) is the research article describing Drought Monitor processes/methods and suggested interpretation. Table 1 from this paper describes the following numeric interpretation of the Drought Monitor categories: D0, Abnormally dry, 20 to <30 percentile chance D1, Drought—moderate, 10 to <20 percentile chance D2, Drought—severe, 5 to < 10 percentile chance D3, Drought—extreme, 2 to <5 percentile chance D4, Drought—exceptional, < 2 percentile chance or approximately a 1 in 50 year/generational drought.
14	Can you contrast the "prediction " role you envision for USGS vs. the longstanding national prediction enterprise that operates within NOAA/NWS/NCEP?	The USGS is looking to generate hydrologic information that is complementary to the prediction capacity currently provided by NOAA/National Weather Service/National Centers for Environmental Prediction short-term and seasonal outlooks, the NWS River Forecast Centers water supply forecasts, the NRCS water supply forecasts, and others. USGS is specifically focusing on machine learning methods for predicting streamflow and groundwater drought onset, duration, and severity in an early warning capacity.
15	Could you please talk about timelines and deliverables for these data driven project models?	Current data-driven modeling is being conducted for Federal fiscal years 2023 and 2024 and has the goal of identifying the methods and approaches that generate

		the most accurate early warning predictions of streamflow and groundwater drought onset, duration and severity. As a part of this modeling, we are using approaches that may allow us to develop new public-facing tools to provide hydrological drought relevant information for decision making.
16	In your upcoming report about the listening sessions, do you anticipate adding information about relative number of responses you received for a specific type of response or other type of prioritizing efforts to understand the relative importance of the various groupings of responses you received from this group of 300–600 participants?	Yes, the Listening Session Summary Report will include more specific data about frequency of certain types of needs/responses, as well as a clearer prioritization of the takeaways. We realize that we shared a lot of information at this final report-out and recognize that we need to make the information more digestible/actionable.
17	Where can I find the latest USGS and NIDIS data on water availability within the Amargosa Desert Region?	There are a number of existing tools providing water availability relevant information across the U.S. The National Water Dashboard provides real-time conditions for streamflow gages, groundwater wells, and water quality sites with the ability to display conditions in the context of peak and low flows, and high and low water levels. The dashboard also allows the user to overlay these conditions with present snowpack, precipitation, drought, and other conditions as well as to display forecast precipitation and storm track information. The WaterWatch website provides additional ways to view information for surface water, groundwater, and water quality sites, with tabs to look at drought relevant information, including the past conditions for the past several weeks, to assess conditions by multiple reporting units (states, hydrologic unit codes etc.), and to look at current and prior years of data in the context of long-term average conditions. If you have additional follow-up questions from the USGS, please reach out to the Nevada Water Science Center.