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Building drought resilience in agriculture: Partnerships and public outreach

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ABSTRACT

Since 2012, drought has had a significant impact on agricultural production in the United States, primarily on the Great Plains and in the West. However, in recognition of the value of both mitigation and response, USDA and its partners are developing a more proactive approach to dealing with the effects of drought. A recent collaboration is the National Drought Resilience Partnership, which was established in 2013 as part of the President's Climate Action Plan. This federal partnership is designed to leverage existing programs and infrastructure in a coordinated effort to help communities better prepare for drought.

By highlighting some of the successes achieved during the recent drought in California, this article will examine some of the current activities underway specifically designed to help the agricultural community. Gaps will be identified as well, as a plan to more efficiently provide information to decision makers and the public is presented. In particular, specific programs and agencies will be identified as potential leads to address where future resources should be focused, including implementation of a National Soil Moisture Monitoring Network.

1. Background

1.1. USDA's Weather and Climate Activities

The primary factor affecting agricultural production is growing season weather, be it extreme or relatively uneventful. Consequently, farmers, ranchers, foresters, and others involved with the agricultural sector pay close attention to weather, particularly when monetary losses occur and livelihoods are threatened. According to the National Centers for Environmental Information of the National Oceanic and Atmospheric Administration, the second costliest type of disaster (behind tropical cyclones) is drought, averaging $9.4B in losses per event since 1980 (NCEI, 2015), which is illustrated in Fig. 1.

Given the significance of drought and other weather events to the Nation's farming community, the United States Department of Agriculture (USDA) unsurprisingly has a long history of monitoring, and responding to, drought and other weather and climate events. Upon the establishment of the Department in 1862, the first Commissioner of Agriculture — Isaac Newton — organized a group of volunteer farm reporters, whose observations of weather and crops served the basis for the first Monthly Crop Report the following year (Hughes, 1972). As early as 1870, Congressional action mandated the taking of meteorological observations, which eventually became the official duty of the War Department's Signal Service. In 1890 the Signal Corps (formerly known as the Signal Service) was transferred to the Department of Agriculture. For the next 50 years, the Weather Bureau (as the agency was known) was a part of the USDA before being transferred to the Department of Commerce in 1940. Despite the move, however, the partnership between the agricultural and weather services did not end. For example, the "Weekly Weather Chronical", which was first published by the Signal Service in 1872, continued its publication uninterrupted to eventually become today's *Weekly Weather and Crop Bulletin* (Hughes, 1972).

As evidence of the need for continued collaboration, the Departments of Agriculture and Commerce have formally partnered in several instances to ensure seamless transfer of technology and data between researchers and analysts concerned with the impacts of weather and climate on the Nation's agriculture. A Memorandum of Understanding (MOU) was developed between the Departments in 1967, outlining the provision of weather and climate data and analysis from the Environmental Data Service to USDA's Statistical Reporting Service. An agreement forming the

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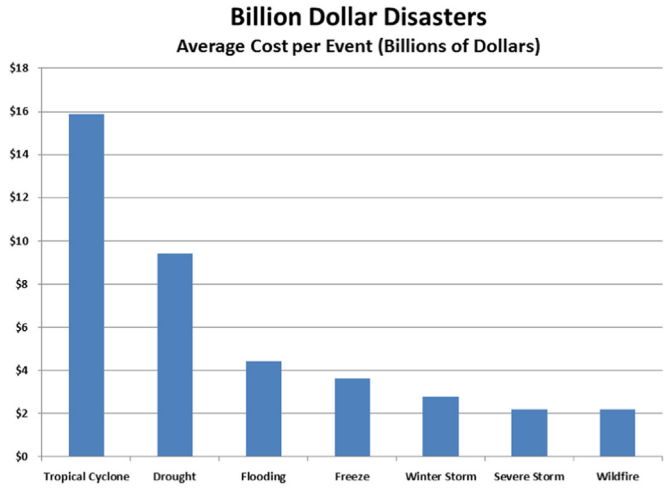

Fig. 1. Billion dollar disasters (Data from: NOAA National Centers for Environmental Information).

Joint Agricultural Weather Facility (JAWF) — the agency currently responsible for the publishing of the *Weekly Weather and Crop Bulletin* — was signed in 1978, establishing for the first time a jointly-operated agency housing both USDA and National Weather Service (NWS) meteorologists at USDA headquarters in Washington, DC (Motha and Heddinghaus, 1986). Over the years, other USDA programs using data obtained by the National Weather Service data emerged, requiring the establishment of guidelines for uses and information delivery to the public. One example is the Pasture, Rangeland, Forage Pilot Insurance Program administered by USDA's Risk Management Agency. The program, based on a precipitation-derived gridded Rainfall Index, is designed to allow producers to buy insurance protection for losses of forage (RMA, 2015). Unlike the JAWF agreement, RMA obtains the information informally from NOAA, although a formal agreement is being considered to ensure continuity of products.

While relying on the NWS for much of its weather and climate data, USDA maintains weather and climate monitoring networks in support of activities of interest to farmers, ranchers, and foresters (Fig. 2). Beginning in the 1970s, the Forest Service, along with the Bureau of Land Management, began development of a network of Remote Automated Weather Stations RAWS

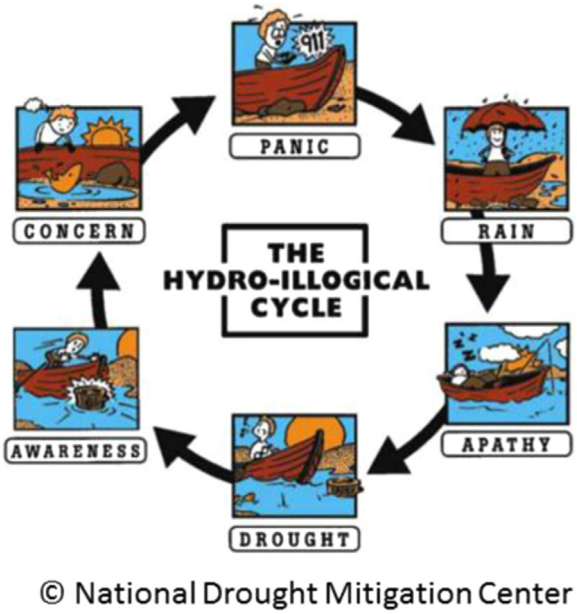

Fig. 3. The Hydro-Illogical Cycle (Source: National Drought Mitigation Center).

(Zachariassen et al., 2003). Among other uses, data from the network are used to forecast daily fire danger indices. Meanwhile, the National Water and Climate Center of the Natural Resources Conservation Service operates several networks (OFCM, 2015) for the purpose of monitoring the Nation's water resources. The Snow Telemetry (SNOTEL) Network collects and transmits data in support of the Snow Survey and Water Supply Forecasting Program. Manual collection sites are also monitored by land and air. In addition, the Soil Climate Analysis Network (SCAN) monitors soil temperature and soil moisture in support of national drought monitoring, agriculture production, and climate change research. Similar to the way NOAA data is used but USDA, these data are freely shared with NOAA and are incorporated into its operational products as needed.

1.2. The Evolution of Current Drought Activities

Drought can be a difficult phenomenon to plan for. Some areas

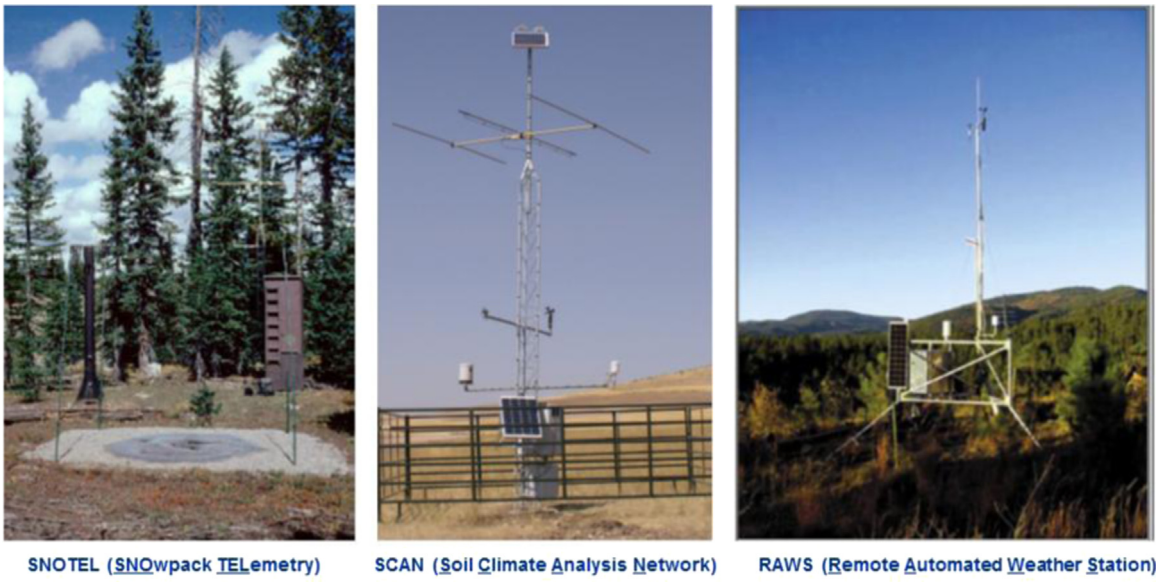

Fig. 2. Photos of weather and climate platforms operated by USDA (Source NRCS/FS).