Drought Early Warning System (DEWS)

Brain-storming and discussion

Why Drought Early Warning?

Drought is a recurring natural phenomenon that is often called “the creeping disaster.” Unlike other natural hazards, such as hurricanes, floods, and tornadoes, droughts develop gradually over a long period of time. The gradual nature of drought can prevent us from recognizing drought’s true impacts, often diminishing the urgency that would otherwise trigger a timely and comprehensive response.

Recognizing drought risks in a timely manner is dependent on our ability to monitor and forecast the diverse physical indicators of climatological drought, as well as relevant economic, social, and environmental impacts. A DEWS provides accurate, timely, and integrated information on drought conditions at the relevant spatial scale. This can help governments and communities make proactive decisions to minimize the economic, social, and ecosystem losses associated with drought.

The Importance of Drought Early Warning Systems (DEWS)

Allows for early drought detection	Allows for proactive (mitigation) and reactive (emergency) responses	“Triggers” actions within a drought plan	Provides information for decision support

Drought Early Warning Components

A regional DEWS is not simply the dissemination of a forecast. It is an integrated information system that comprises multiple information sets, such as forecasting, monitoring, research, capacity-building, and public outreach. A DEWS encourages innovation by integrating new, locally relevant drought information, and supports the introduction of new technologies that detect and communicate drought risks and warnings.

Each of the regional DEWS integrates five key components of a drought early warning system—observation and monitoring, prediction and forecasting, planning and preparedness, communication and outreach, and interdisciplinary research and applications—and implements them according to regional needs and assets.

Observation & Monitoring

Promoting the growth of observational networks and drought indices by increasing the data resources available for drought monitoring and filling spatial and temporal gaps in data coverage.

Prediction & Forecasting

Assessing current operational drought forecast system capabilities and developing a strategy to improve official monthly, subseasonal, and seasonal drought outlooks.

Planning & Preparedness

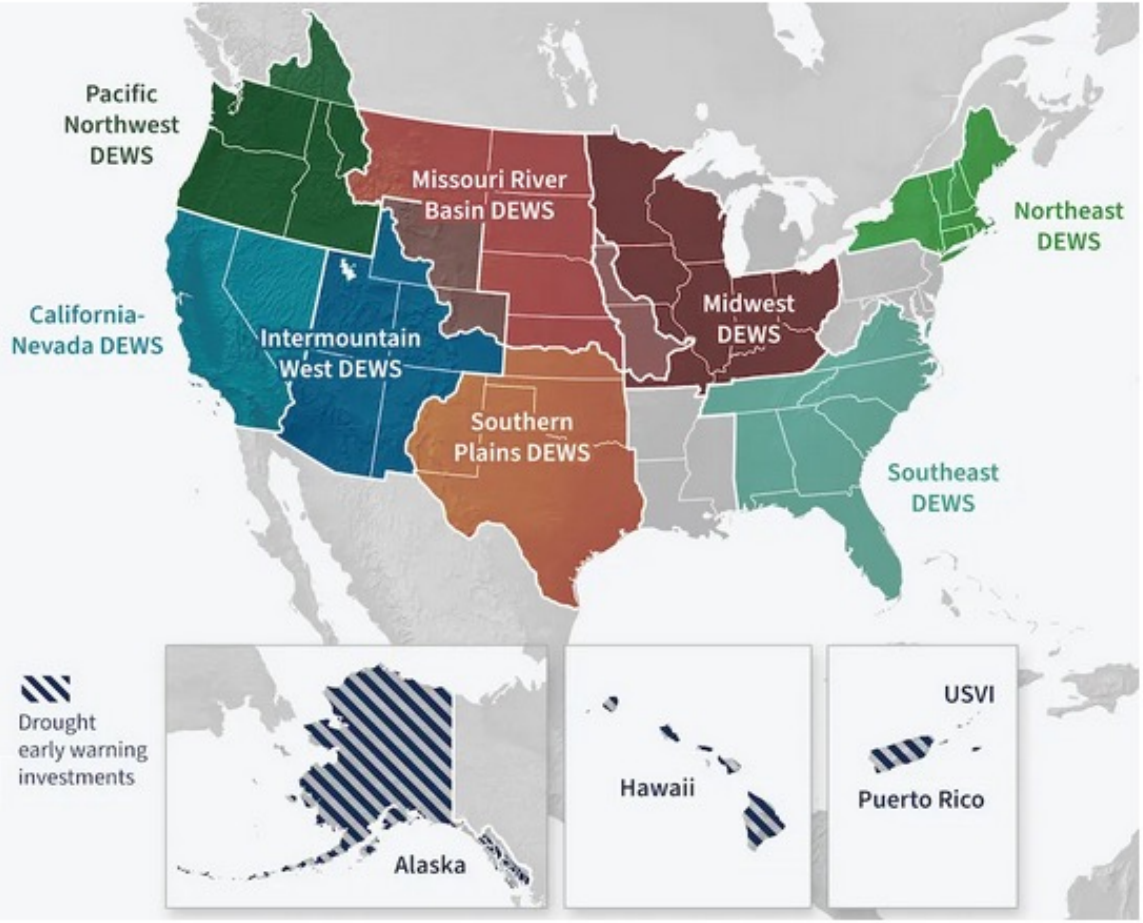
Improving the dissemination of drought research, tools, and planning information in formats that are timely, accessible, and useful for drought management and decision making.

Communication & Outreach

Providing drought information and tools to increase individual and community capacity for minimizing the social, economic, and environmental impacts of drought.

Interdisciplinary Research & Applications

Ensuring federal research is coordinated and integrated into decision making, leading to better informed and more timely decisions by vulnerable stakeholders and government leaders.



DEWS: A Regional Approach

A Drought Early Warning System, or DEWS, is **a network of regional and national partners that share information and coordinate actions to help communities in the region cope with drought.** Developing and implementing regional DEWS allows for responsiveness to particular geographic and hydrologic circumstances, as well as value-added information needs specific to stakeholders in the respective areas.

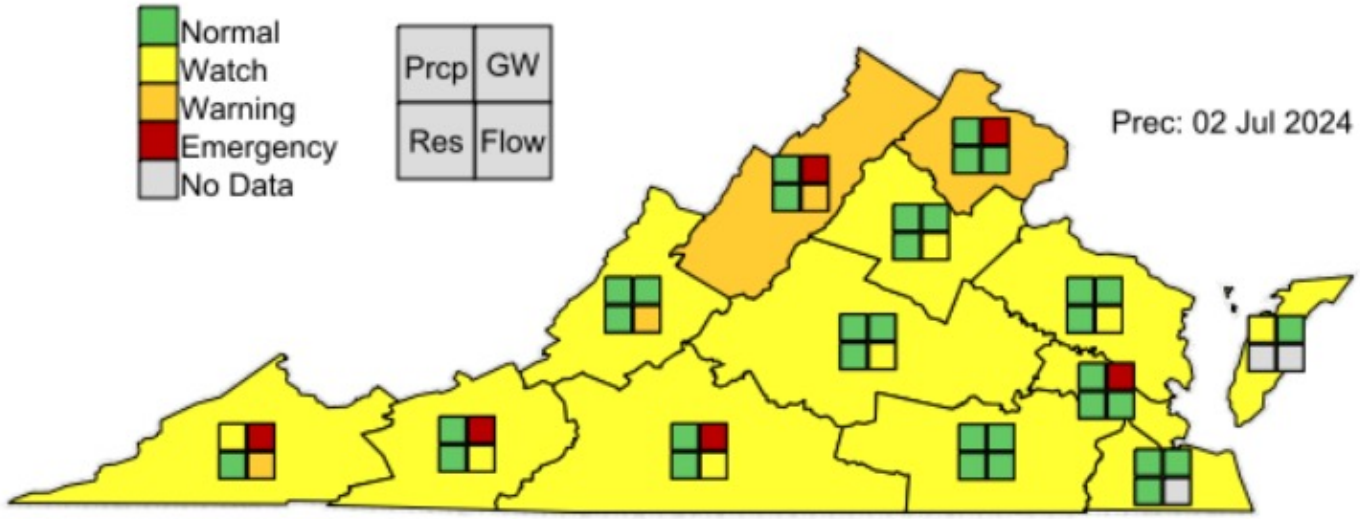
Through developing regional DEWS, the National Integrated Drought Information System (NIDIS) is building the foundation for a nationwide DEWS to improve drought monitoring, forecasting, planning, and preparedness capabilities across the nation.

GET REGIONAL DROUGHT INFORMATION

Stages of a canonical drought monitoring progression

Stages of Drought Monitoring Progression	Example	Drought Alert Level
Before Season: Identify high risk regions	Rainfall and crop model trends indicate increasing drought in Eastern Ethiopia	**Mild Concern**
At Onset: Link to large scale climate	Strong El Niño likely to bring reduced rains to Ethiopia	**Concern**
Mid Season: Monitor Hydrology	March-to-July rains very poor over Ethiopia	**Deep concern**
Mid Season: Combine obs w. forecasts	Combining May-July and August-September rainfall forecasts indicate very low seasonal totals	**Severe drought likely**
Post Season: Place in historic context	March-Septemper rainfall totals indicate the worst drought in 50 years	**Severe drought certain**
Post Season: Assess impacts and severity	Assessments of crops, livestock and food security indicate severe impacts	**Very severe drought certain**

Citation: Bulletin of the American Meteorological Society 100, 6; 10.1175/BAMS-D-17-0233.1



- Precipitation (Prcp)
- Groundwater Levels (GW)
- Streamflow (Flow)
- Reservoir Levels (Res)

Fire restriction: avoid outdoor burning

Category	Impact
D0	Pastures are dry; mild crop stress is noted; irrigation increases
	Lawns are brown
D1	Crop stress increases
	Hay production is reduced; producers feed hay to cattle early
	Wildfire danger is higher than the seasonal normal
	Increased signs of wildlife; trees and landscape are drought stressed
	Streamflow is reduced; lake and reservoirs levels decline
	Voluntary water conservation begins
D2	Dryland crop yields are low
	Wildfires are difficult to extinguish
	Swimming areas and boat ramps begin to close
	Voluntary and mandatory water use restrictions are implemented, people are asked to refrain from nonessential water use
D3	Hay is scarce, producers are purchasing outside of state; nitrate levels in forage are high
	Outdoor burn bans are implemented; wildfires are widespread
	Landscaping and greenhouse businesses lose revenue
	Aquatic wildlife is dying; fewer trout are stocked
	Hydropower generation decreases
	Voluntary conservation is requested even in sufficient water level areas; mandatory restrictions become more severe and fines are given to violators; stream levels are extremely low
D4	Producers sell cattle; hay shortages and crop loss occur; farmers are stressed
	Daily life is affected for all citizens; people pray for rain; drought education seminars increase
	Epizootic hemorrhagic disease is widespread in deer
	Reservoirs are low; officials are counting the days of remaining water supply; well water is low; residents are hauling water

D0 - Abnormally Dry - Abnormally Dry

- Review and be prepared to implement your Water Shortage Response Plans at the appropriate time.
- Participate, as appropriate, in regional and local coordination for the management of water resources.
- Stay informed on drought conditions and advisories (www.ncdrought.org).

D1 - Moderate Drought - Moderate Drought

- Adhere to local water use restrictions.
- Participate, as appropriate, in regional and local coordination for the management of water resources.
- Stay informed on drought conditions and advisories (www.ncdrought.org).
- Project water needs and available water supply for a ninety day period from the issuance of this advisory.
- Assess your vulnerability to the drought conditions and adjust water usage to prolong available supply.
- Inspect water delivery system components (e.g. irrigation lines, fixtures, processing equipment, water system lines, etc.), repair leaks and ensure that existing equipment is operating as efficiently as possible.
- Minimize nonessential uses of water.
- Implement available public awareness and educational outreach programs emphasizing the need to conserve water.

D2 - Severe Drought - Severe Drought

- Implement Water Shortage Response Plans, if not already enacted.
- Stay informed on drought conditions and advisories (www.ncdrought.org).
- Participate, as appropriate, in regional and local coordination for the management of water resources.
- Reexamine water delivery systems to minimize water loss and maximize water use efficiency.
- Eliminate nonessential uses of water.
- Evaluate the feasibility of incorporating water reuse, reclamation and/or recycling into daily operations.
- Seek to reduce water usage by, at least, the same percentage as the percent differential between normal seasonal water supply availability and the actual water supply availability resulting from current drought conditions.
- Increase public awareness and educational outreach programs emphasizing the need to conserve water.

Drought Early Warning Systems (DEWS)

- Seamless drought monitor
- Early drought detection
- Deterministic or probabilistic drought outlook
- Provides information for decision support
- Proactive (mitigation) and reactive (emergency) responses
- “Triggers” actions within a drought plan

Research

- Restore adequate monitoring infrastructure.
- Improve understanding of drought processes and relationships with other factors.
- Need more studies on the ecosystem services that could be lost and their socioeconomic and cultural impacts.

Management

- Manage stressors that interact with climate change.
- Include drought in landscape conservation design.
- Decision support tools.
- Support land management partnerships.
- Promote resilience, fire management, confront invasives, re-establish rare species habitats, insurance populations.

Education

- Increase public awareness – residents and visitors (especially about fire and water issues).
- Increase awareness of elected officials.
- Sustainability agenda.