Climate Adaptive Drought Planning (CADP)

Western States Water Council

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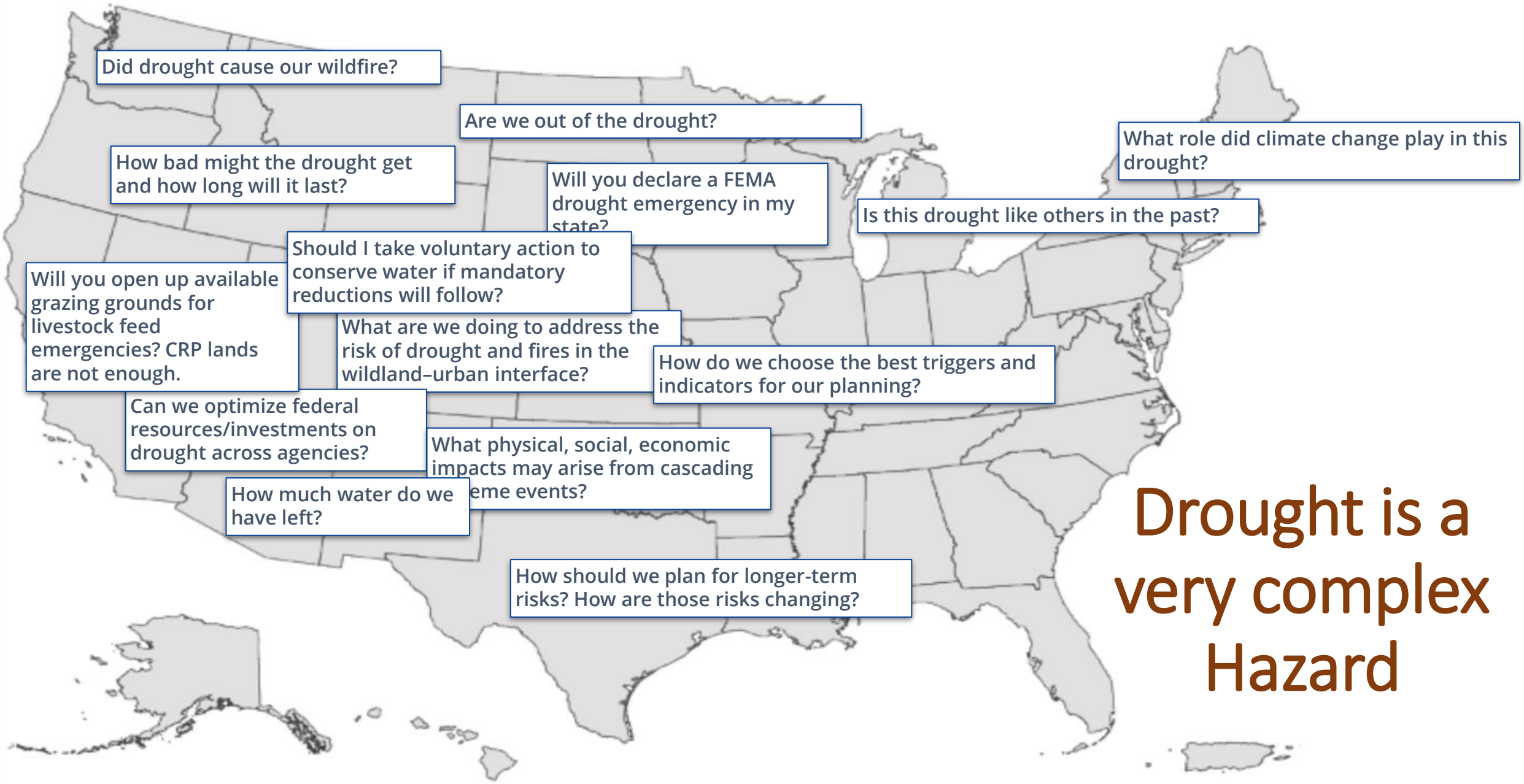
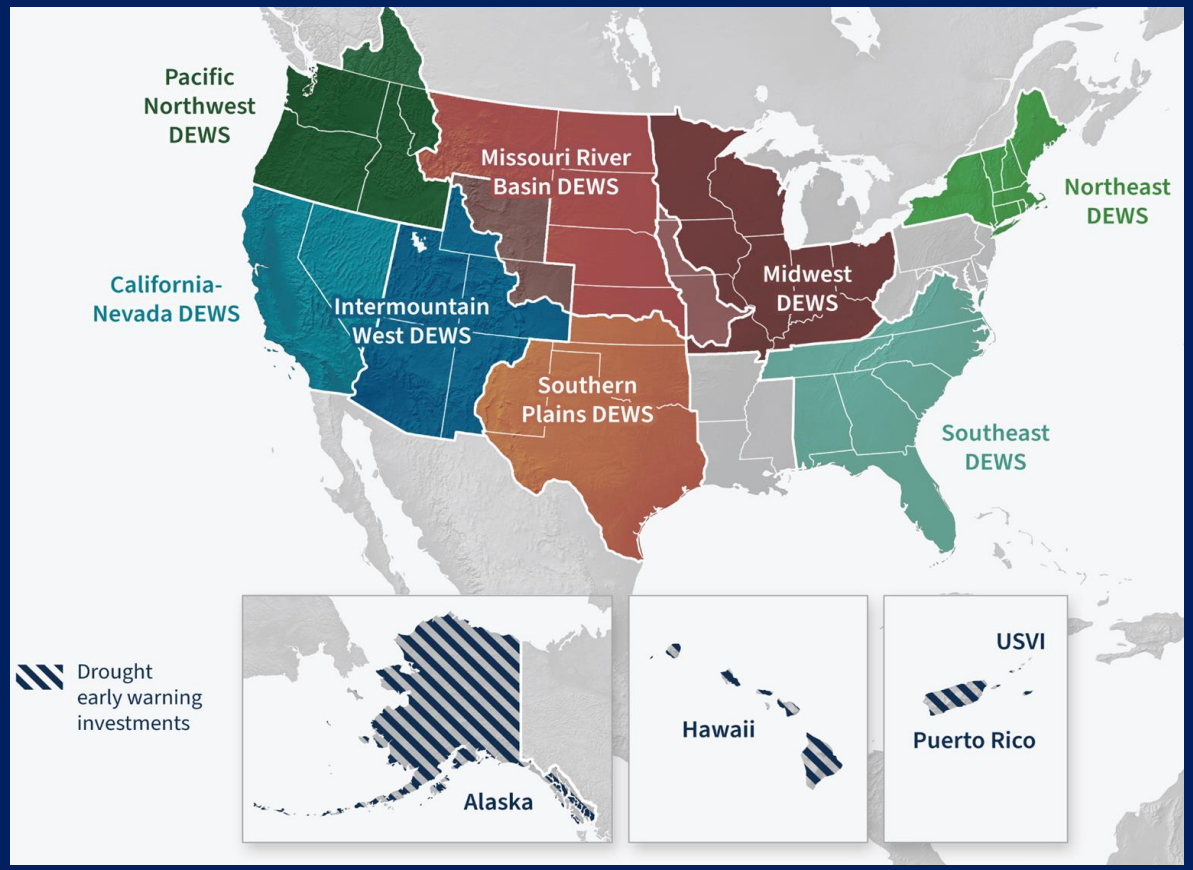
September 13, 2023


Did drought cause our wildfire?
Are we out of the drought?
What role did climate change play in this drought?
How bad might the drought get and how long will it last?
Will you declare a FEMA drought emergency in my state?
Is this drought like others in the past?
Should I take voluntary action to conserve water if mandatory reductions will follow?
Will you open up available grazing grounds for livestock feed emergencies? CRP lands are not enough.
What are we doing to address the risk of drought and fires in the wildland–urban interface?
How do we choose the best triggers and indicators for our planning?
Can we optimize federal resources/investments on drought across agencies?
What physical, social, economic impacts may arise from cascading eme events?
How much water do we have left?
How should we plan for longer-term risks? How are those risks changing?
Drought is a very complex Hazard

National Integrated Drought Information System (NIDIS)

Act of 2006 (P.L. 109-430) prescribed a comprehensive, interagency approach for drought monitoring, forecasting, and early warning planning and preparedness to help states and local communities cope with the impacts of drought.

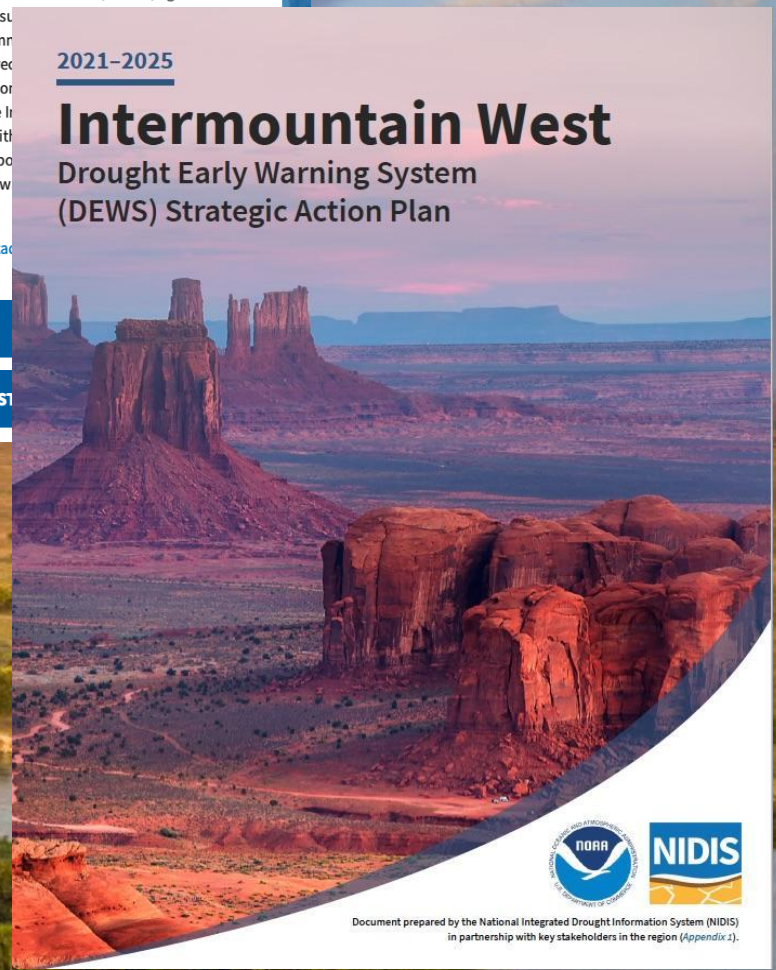
Drought Early Warning System Regions

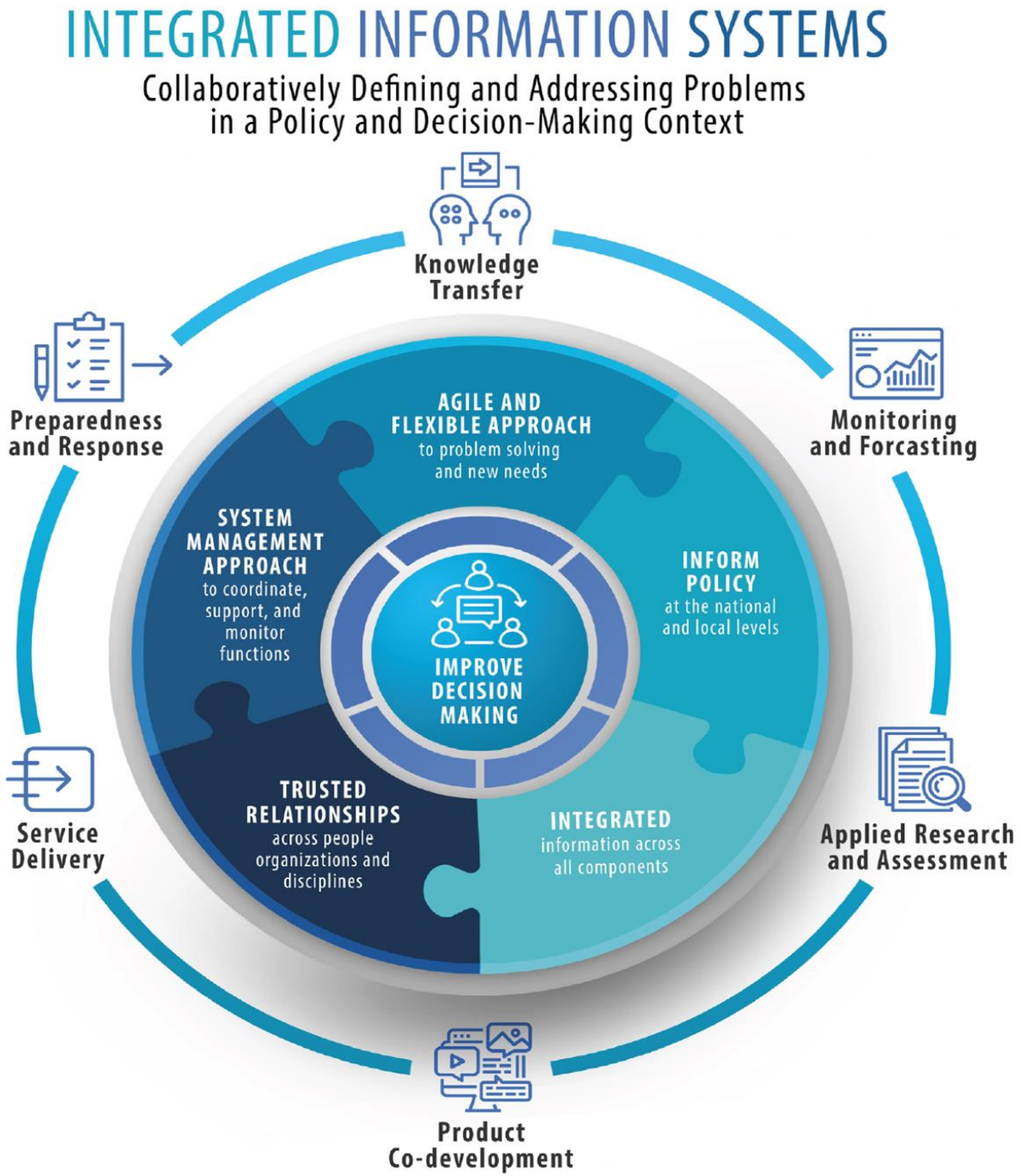


NIDIS fulfills this mandate by…

- Advancing Regional Drought Early Warning Systems (DEWS)
- Improving drought prediction and forecasting
- Supporting drought planning and preparedness
- Supporting drought impact assessments
- Strengthening collaboration
- Leading the U.S. Drought Portal: www.drought.gov

Intermountain West Drought Early Warning System





What is an Integrated Information Systems (IIS)?

- **Whole-System** approach for enabling and strengthening capabilities to manage and mitigate societal risks from complex environmental hazards (e.g., heat, drought, floods) –across sectors, timescales, and disciplines.
- NIDIS is the National Integrated Drought Information System (NIDIS)

Unique Role of NIDIS

1. **Convening and Coordination-** Partnerships, consultations, networks, workshops, etc.
2. **Delivering Information-** Drought.gov, drought status updates, communications, etc.
3. **Advancing and Integrating Research Into Action-** Applied research, products development, assessments

Interagency collaboration and partnerships are key to all we do!

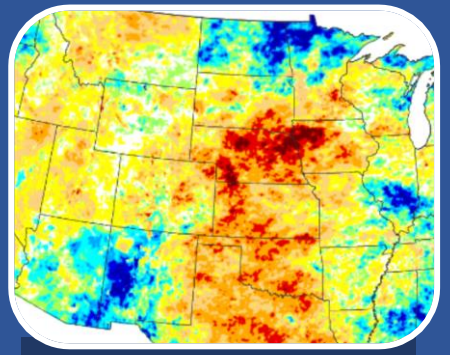
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM (NIDIS)

NIDIS in Action Across the U.S.

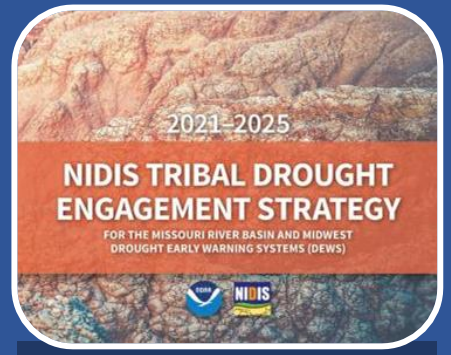
Drought in a Changing Climate

Drought & Wildfire

Climate Adaptive Drought Planning



Drought Indicators & Triggers



Tribal Drought Resilience

Climate Adaptive Drought Planning (CADP)

Extremes in Climate Non-Stationarity Exacerbates Drought Risks & Vulnerabilities

Drought is linked to related to other hazards including post drought flooding, destructive wildfires, & deadly record-breaking heat waves.

Climate change is fueling record-high heat, drought, wildfires in Western U.S.

by Virginia Tech

CLIMATE & ENVIRONMENT

California risk shifts from drought to floods after record rain, snow

Workers use shovels to clear storm drains at a flooded orchard in Porterville, Calif., recently. (Gina Ferazzi / Los Angeles Times)

BY HAYLEY SMITH | STAFF WRITER

MARCH 17, 2023 5 AM PT

Open Access News | Environment News

Global climate change amplifies risk of flash droughts and threatens croplands

May 30, 2023

Image: © HSNPhotography | iStock

The intensification of flash droughts, rapid and unexpected drought events, poses a significant threat to agricultural and ecological systems

Climate Extremes render historically used tools & frameworks for Risk & Vulnerability (R&V) Assessments *less effective* due to record setting weather events & non-stationarity.

What approaches should be taken to incorporate non-stationarity into drought assessment?

Considering changes in variability and drought assessment

Conceptualizing drought in an aridifying (trending-drier) climate

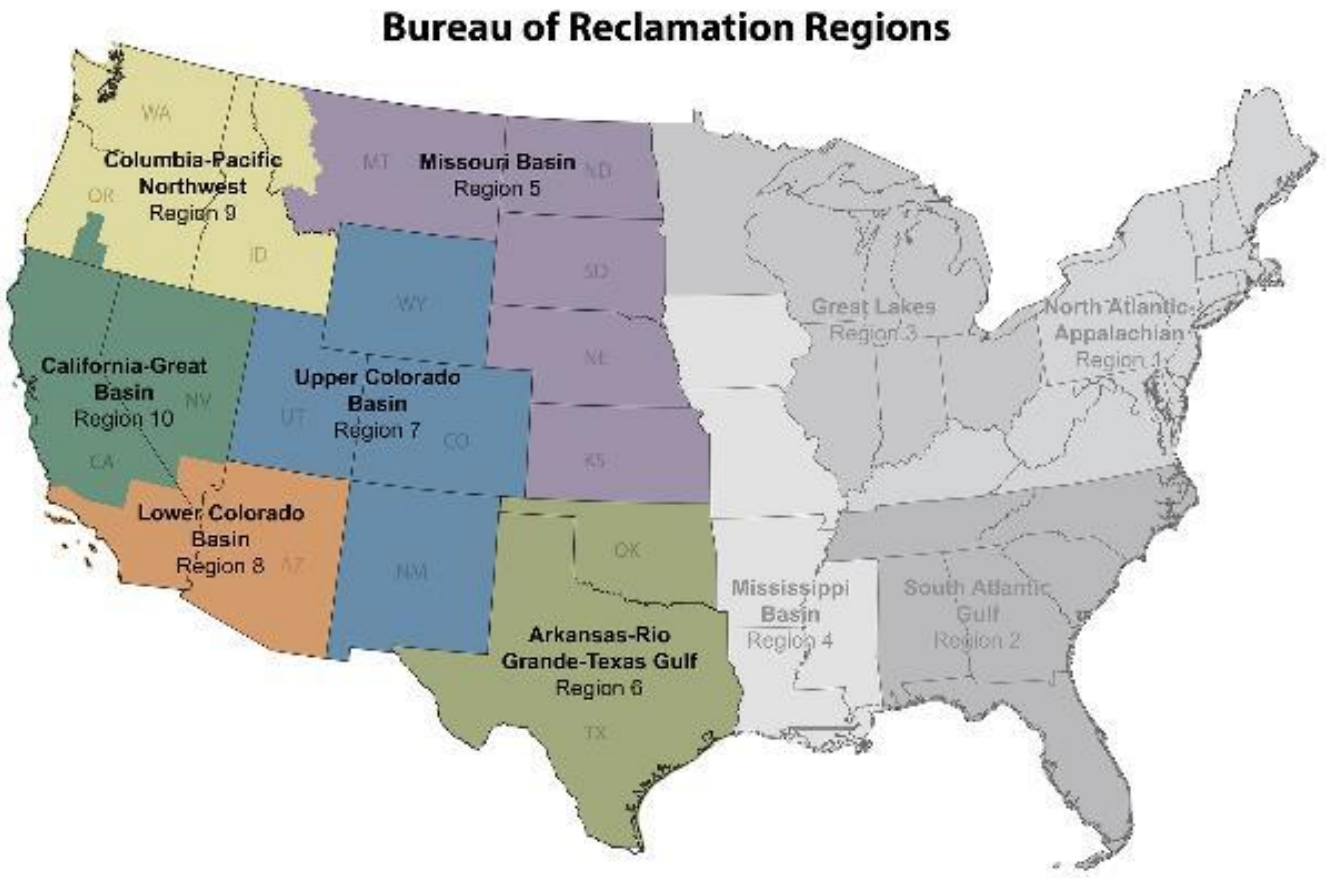
Conceptualizing drought in a humidifying (trending-wetter) climate

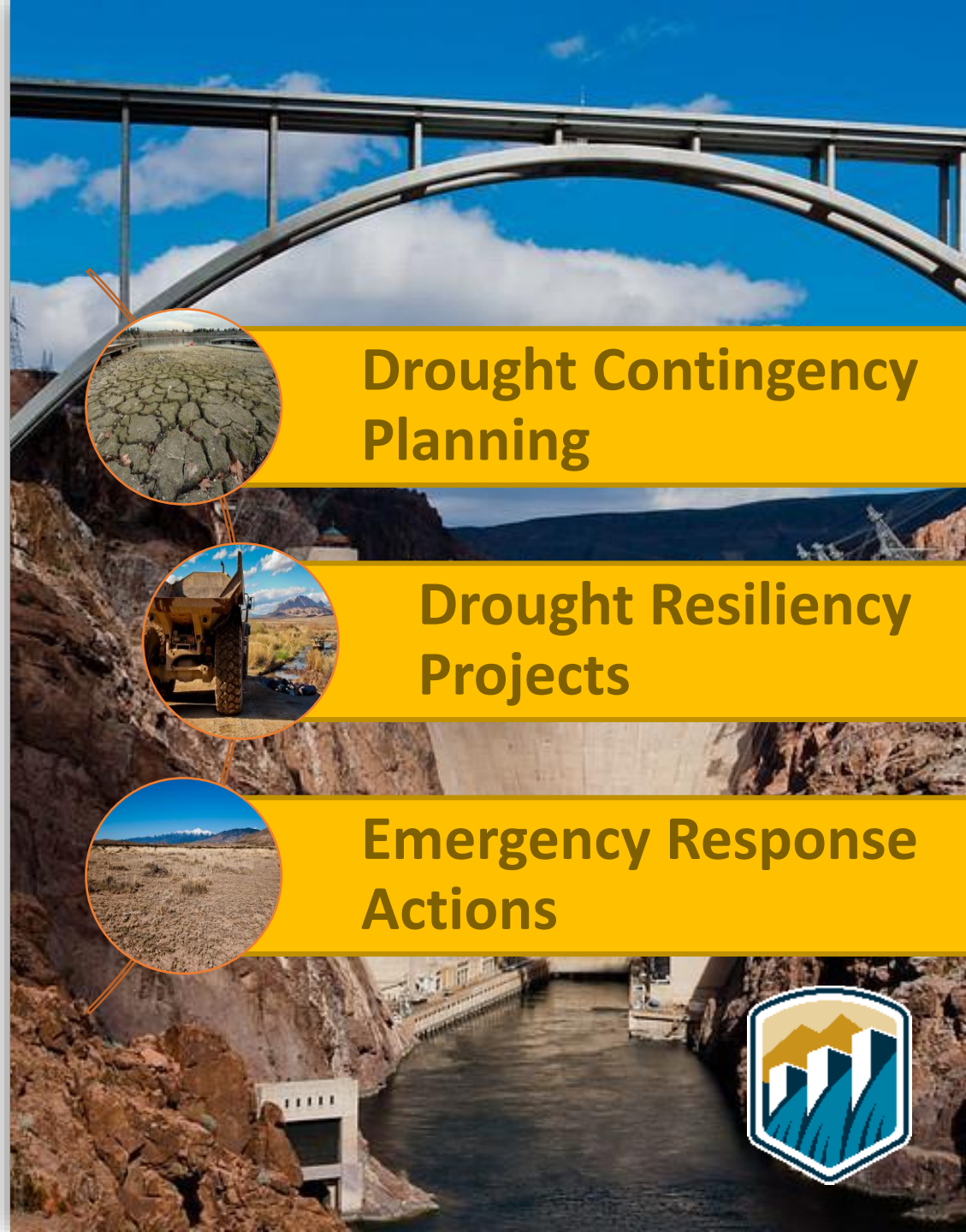
Defining drought in terms of risk/likelihood of event

Climate Adaptive Drought Planning (CADP) Vision:

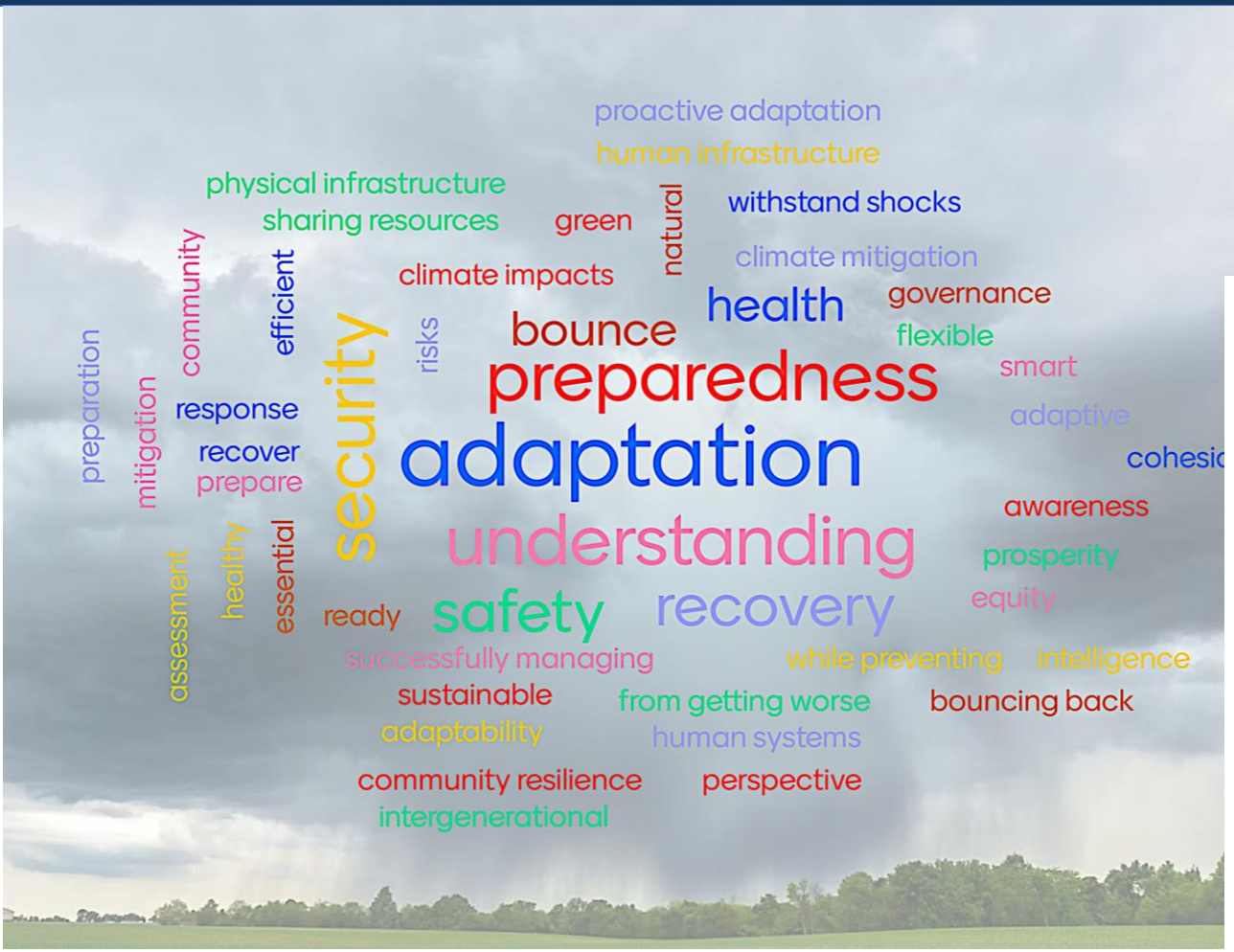
Prepare & plan for future droughts & water challenges in the context of a changing climate extremes and impacts – using contemporary, climate adaptive planning tools for drought R&V assessments, to equitably build drought resilience across sectors & geographic scales.

CADP is being developed in partnership with the US Bureau of Reclamation





CADP Federal Working Group Query on Building Drought Resilience to Climate Extremes and Non-Stationary



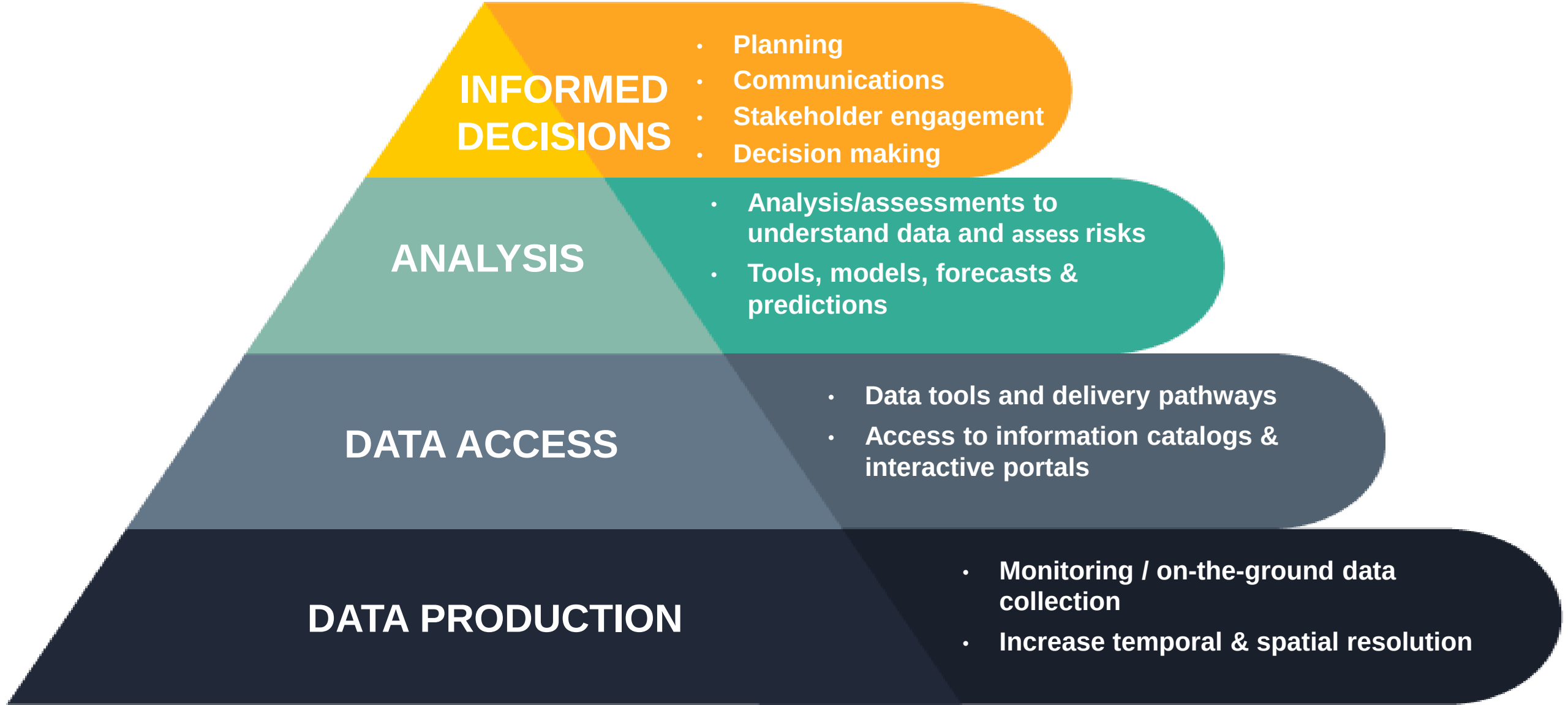
Describe Drought Resilience in a Changing Climate
68 Responses

Climate Adaptive Drought Planning Platform (CADP)

The **Climate Adaptive Drought Planning Platform (CADP)** offers an integrated platform that provides:

- **Needed Technical Assistance** for communities to better Assess Drought Risk & Vulnerability (R&V)
- **Includes impacts from extreme climate events**
- **Improves planning for future droughts & water challenges**

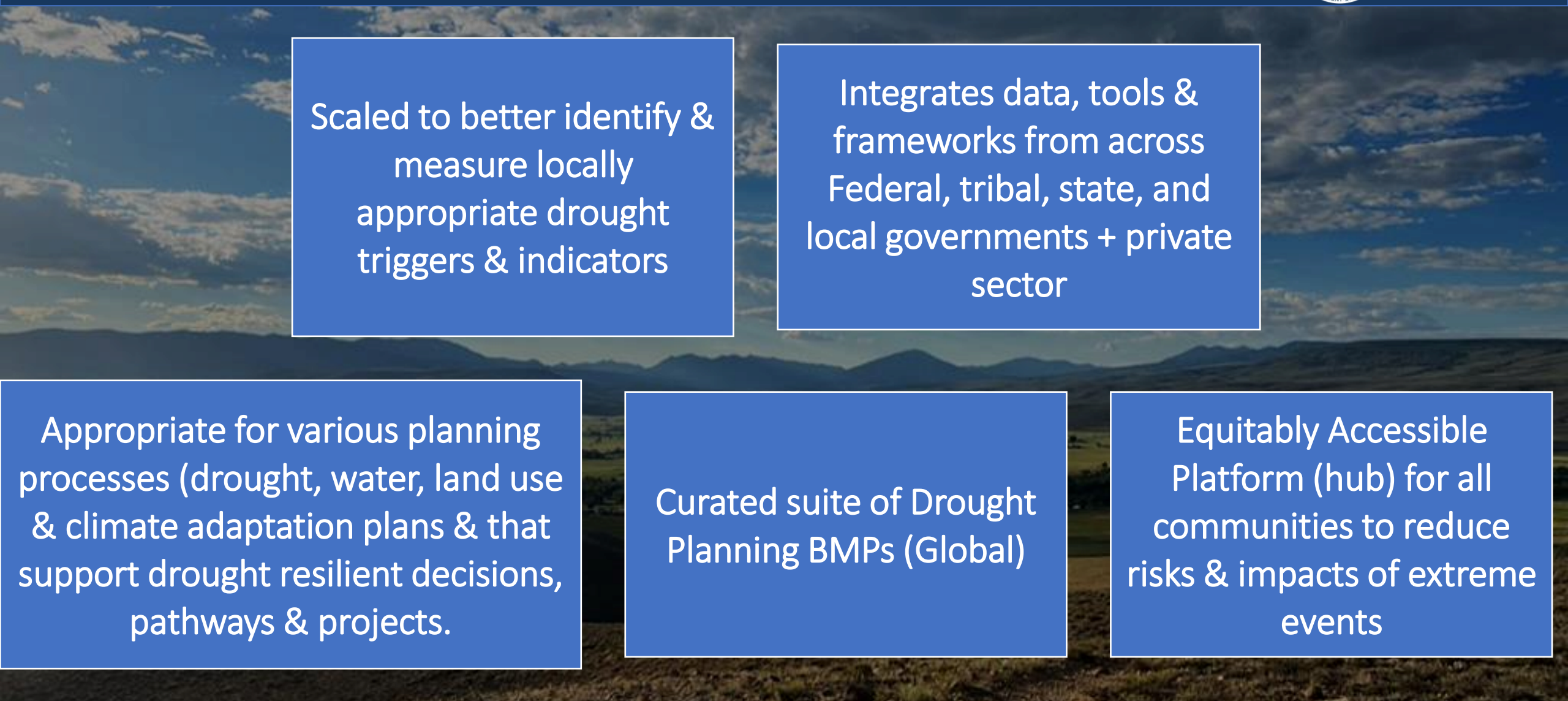
CADP Aims to Support Communities to Improve Informed Decision Making



CADP Objectives

- **Advance Understanding** of Drought Related & Cascading Hazards
- **Build Capacity** to accurately assess Drought Risk & Vulnerability (R&V).
- **Minimize Impacts** of Drought & Water Scarcity
- **Integrate** Data on Climate Extremes & Impacts
- **Facilitate** Climate Adaptive Planning & Preparation
- **Provide** Trusted & Targeted Communication

NIDIS's Climate Adaptive Drought Planning Platform (CADP)



Scaled to better identify & measure locally appropriate drought triggers & indicators

Integrates data, tools & frameworks from across Federal, tribal, state, and local governments + private sector

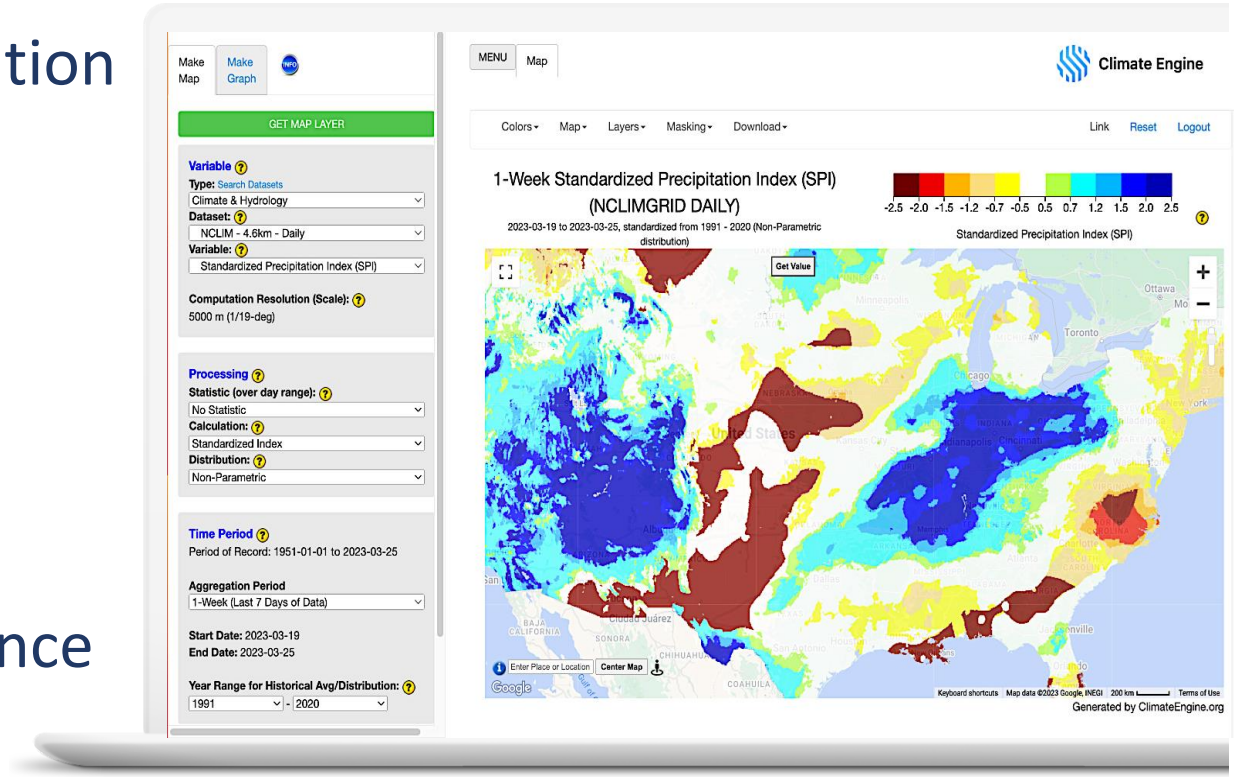
Appropriate for various planning processes (drought, water, land use & climate adaptation plans & that support drought resilient decisions, pathways & projects.

Curated suite of Drought Planning BMPs (Global)

Equitably Accessible Platform (hub) for all communities to reduce risks & impacts of extreme events

Climate Engine – The Backbone of CADP

- Cloud-based drought monitoring application built on Google Earth Engine
- Provides a **user interface** (app) and **API**
- Access petabytes of climate & earth observation data, with on-demand data processing
- Used operationally on Drought.gov:
  - NOAA-managed Google Cloud instance
  - Process high-res gridded data with lower costs & effort



https://www.climateengine.org/

Google Cloud Partner

Desert Research Institute

Climate Engine®

Menu

Location: State, County, Municipality, Lat/Long, Block Group

Demographics (Census/ACS):
Population (current)
Population (2050)
Social Vulnerability Index

Environmental Conditions: (https://www.mrlc.gov/tools):
% Land cover, HUC, Land Use Categories, NDVI, ET, Soil Moisture, EDDI

Weather (Seasonal & Sub-Seasonal):
Storm Types – Rain, Hail, Snow, Blizzard
Extremes

Climate Conditions: (Similar to EPA CREATE & Aquaduct Water Risk Atlas):
Temperature
Precipitation

Critical Water Infrastructure Conditions: (Current, Needed, Future):
% Aging Infrastructure (Pipes, Reservoirs, Storm Water, Waste Water System
% New Infrastructure

Economic Sector Mapping (Water/Energy/Food Nexus):
% Jobs in Water Dependent Sector: A, B, C, X, Y, Z (Current)
% Jobs in Water Dependent Sector: A, B, C, X, Y, Z (2050)

Water Supply Portfolio: % Surface (local & Inter-basin transfer)/Ground/ReUse-Storm/ ReUse-Indoor Capture) DigCst Lake Lvls:
% Current
% 2050

Water Demand Mapping:
% Use by Sector A, B, C, X, Y, Z (Current)
% Use by Sector A, B, C, X, Y, Z (2050)

Drought Conditions: Indicators, Triggers, Impacts

Water Budget Equation Functionality

Drought Risk Profile

		Consequence				
		1	2	3	4	5
Likelihood	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10
Risk	Low		Moderate		High	

CADP Risk Profiles

Scenario: D 3-4 RCP 4.5	Exposed System: Water Storage & Conveyance	Low Risk (1)	Moderate Risk (2)	Significant Risk (3)	High Risk (4)	Extreme Risk (5)

		Consequence				
Likelihood		1	2	3	4	5
	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10
Risk	Low		Moderate		High	

High Risk (Red)

Unacceptable, major disruption likely; priority management attention required.

Moderate Risk (Orange)

Some disruption; additional management attention may be needed.

Low Risk (Green)

Minimum impact; minimum oversight needed to ensure risk remains low.

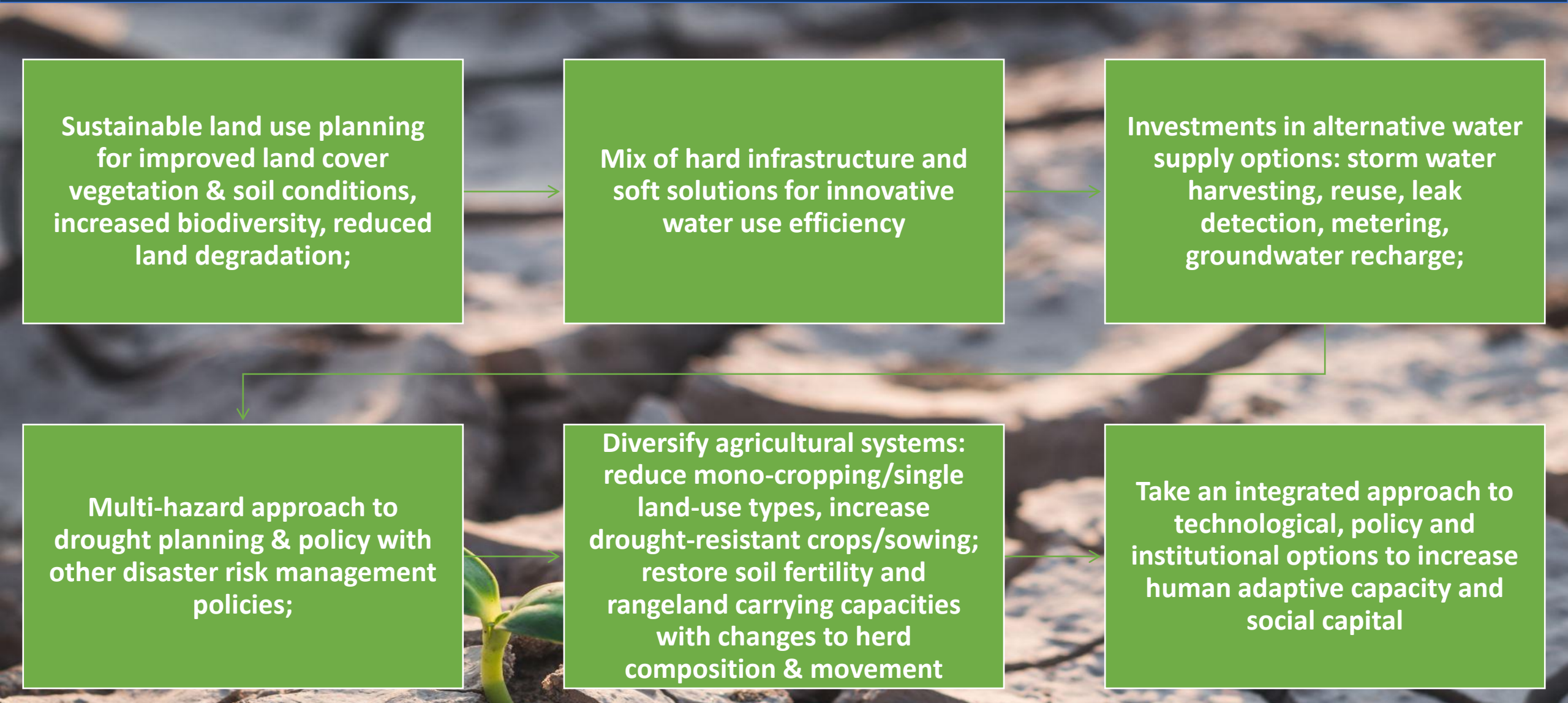
CADP Risk Profiles to Project Priorities

Different risk profiles call for different response strategies.

For example, prolonged drought that results in crop loss can pose different drought resilience projects for an agricultural producer than a water supplier.

- **Dimension:** Socio-economic, Water Resources, Ecological
- **Sector:** Agriculture, Water supply & Quality, Health & sanitation, Business & Industry, Energy, Fire, Relief, Response & Restrictions
- **Impacts:** Potential for loss of people, livelihoods, ecosystem services, natural assets, infrastructure, as well as economic, social or cultural assets

Drought Resilience Toolbox



Sustainable land use planning for improved land cover vegetation & soil conditions, increased biodiversity, reduced land degradation;

Mix of hard infrastructure and soft solutions for innovative water use efficiency

Investments in alternative water supply options: storm water harvesting, reuse, leak detection, metering, groundwater recharge;

Multi-hazard approach to drought planning & policy with other disaster risk management policies;

Diversify agricultural systems: reduce mono-cropping/single land-use types, increase drought-resistant crops/sowing; restore soil fertility and rangeland carrying capacities with changes to herd composition & movement

Take an integrated approach to technological, policy and institutional options to increase human adaptive capacity and social capital

CADP Fills Two Primary Gaps

Technical Assistance with Drought Risk Assessment

Integrating multiple scientific data sets specific to drought assessment and land use management & planning, with climate change projections and impacts into Drought R&V assessments

CADP Project Timeline

October 2023	May 2024	Feb.2024-June 2026	July-November 2026
Task 1. Needs Assessment: Drought Planning Practices & Guidelines	Task 2. Develop Climate Adapted Planning Toolkit	Task 3. CAPD Risk & Vulnerability Tool Development	Task 4. Plan & Develop Roadmap for a CADP Workshops/Webinars/ Trainings

Collaboratively Developing Drought Resilience Across Scales

CADP will strengthen the ability of communities, ecosystems and economies to anticipate, absorb, accommodate or recover from the effects of drought quickly and efficiently by ensuring the preservation, restoration or improvement of natural capital and community assets and investments.

Thank You!

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www.drought.gov

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National Integrated Drought Information System