Drought Mitigation Measures

Evaluation of Potential Mitigation Measures

Drought mitigation measures are actions, programs, and strategies implemented during non-drought periods to address potential risks and effects and to reduce the need for response actions; implementation of drought mitigation measures improves long term resilience and reliability of the regional water supply.

Eight mitigation measures, and variations or combinations thereof, were evaluated as part of the Drought Planning effort to estimate potential increases in regional water supply. The following table summarizes cost estimate versus volume of water added, advantages, disadvantages, and uncertainties. For purposes of comparison, flow benefits in the table are focused on a 15-day period in August with the cumulative values, where noted, representing the sum of flow benefits over 20-years.

		VOLUME ADDED AT SOURCE			VOLUME INCREASE AT ASHLAND						
	ALTERNATIVE	CUMULATIVE AF/15 DAYS	AVE DAILY CFS	WHERE ADDED	CUMULATIVE AF/15 DAYS	AVE DAILY CFS	COST ESTIMATE	COST PER ACRE-FOOT ADDED AT ASHLAND	ADVANTAGES	DISADVANTAGES	UNCERTAINTIES
	Import Missouri River Water (to Bell Creek/no reservoir)	59,400	100	Waterloo	46,300	80	$76,572,840	$1,654	• Secondary source of water outside of Platte River basin increases reliability of supply. • Operational every year & year-round	• Larger construction cost than many alternatives • Implementation - 5-10 years	• Future regulation on Missouri River • Well field siting
	Sherman Release (400 cfs at St Paul)	47,520	400	St. Paul	15,720	132	$9,628,000	$612	• Utilizes existing facilities (no construction cost; ability to pilot study) • Produces large volume of water on-demand • Loup River historically a reliable water supply source. • Implementation: 3-5 years	• Likely limitation on frequency of call on storage water • Significant conveyance losses from release point to Lower Platte River (Assumed allowed 4 out of 20 years)	• Requires cooperation and agreements with existing facility owners. • Negotiations will dictate price. • Cost estimates based on similar agreements in state.
	Sherman Release (250 cfs at St. Paul)	29,700	250	St. Paul	9,800	83	$6,955,000	$710			
	Skull Creek Res. Rel. (100 cfs at Linwood)	59,400	100	Linwood	46,300	80	$32,630,000	$705	• Produces large volume of water on demand • Potential for multi-purpose facility	• Larger construction cost than many alternatives • Land requirements, involving multiple landowners • Implementation: 5-10 years	• Runoff volume varies year to year • Land use impacts on runoff • Implementation (permitting, land purchase, etc.)
	Bell Creek Reservoir (Release 100 cfs at Waterloo)	59,400	100	Waterloo	46,300	80	$81,520,000	$1,761			
	Pump Missouri River water (via alluvial well-field) into Bell Creek Reservoir	59,400	100	Waterloo	46,300	80	$129,564,000	$2,798	• Secondary source of water outside of Platte River basin increases reliability. • Operational every year & year-round. • Importing into Bell Creek Reservoir requires a lower capacity system for importing water - saving money	• Larger costs associated with combining alternatives that require both land and infrastructure. • Implementation: 5-10 years	• Future regulation on Missouri River • Well field siting • Implementation (permitting, land purchase, etc.)
	Middle Loup Canal Recharge (Historic Loup Canal Operations)	7,525	13	Arcadia	2,525	4	$16,360,000	$6,478	• The canal recharge and dry-year lease projects are passive mitigation measures whose benefits (passive baseflow returns) accrue throughout the year, adding to the overall supply reliability. • Existing infrastructure – no initial construction costs • Implementation: 3-5 years	• Unavailable to release a pulse of water volume "on-demand". • Takes time for the full benefit to be realized in river (lag effect) and some attenuation	• Requires cooperation and agreements with existing facility and/or landowners. • Negotiations will dictate price. • Cost estimates based on similar agreements in state. • Amount of improvement of overall system supply reliability from year around accretions
	Middle Loup Canal Recharge (Full Hydropower Right downstream)	2,034	3	Arcadia	634	1	$5,225,000	$8,238			
	Alluvial sandpit pumping	14,850	100	Leshara	14,850	100	$5,980,000	$403	• Minimal infrastructure costs (pumps from existing sandpits) • Utilizes existing sandpits (no construction costs) • Implementation: 3-5 years	• Limited operation window as pumping this close to the river may cause depletions to the stream (lag effect) that amplify impacts during extended drought • Logistics of securing agreements with multiple landowners • Likely limitation on the number of calls allowed in a 20-year period (Assumed 5 out of 20 years)	
	Augmentation Well-field	59,400	100	TBD	59,400	100	$81,008,040	$1,364	• Available every year & year-round • Can be located closer to critical reach to reduce losses compared to alternatives producing similar volumes upstream in the Basin.	• Land & infrastructure costs make this one of the more expensive alternatives. • Adds to overall depletions • Implementation: 5-10 years	• Siting to avoid interference with existing wells. • Long-term reliability of aquifer
	Rapid Response Area/ Dry-year Lease	4,000	33	Columbus to Louisville	4,000	33	$248,500,800	$62,125	• No infrastructure or construction necessary.	• Logistics of securing agreements with thousands of producers • Likely limitation on the number of calls allowed in a 20-year period (Assumed 4 out of 20 years) • Most expensive of all the alternatives by an order of magnitude based on assumptions.	• Negotiations will dictate price. • Cost estimates based on similar agreements in state, and factors such as cost differential between irrigated and dry land rental rates. • Uncertain how many producers would participate (benefits assume 100% participation which is unlikely)

Drought Mitigation Measures

Drought Monitoring

The recommended timeline for drought monitoring is displayed in graphic to the right. Hydroclimate indices SPI and PDSI should be monitored year round. Groundwater levels are monitored by NRDs in the spring and fall of each year in accordance with their individual groundwater management plans. Snowpack volumes should be monitored from the beginning of the calendar year through the runoff season. Streamflows should be monitored starting in late spring through the summer when water use for irrigation, cooling, and lawn watering is at its peak.

Many indicators and indices exist to help identify drought conditions in the Lower Platte River Basin. These include hydroclimate indices, streamflow levels, groundwater aquifer levels, Rocky Mountain snowpack, and Lake McConaughy reservoir storage levels. Additionally, as previously stated, the focus of this first increment of the Drought Plan is on augmenting surface water supplies in the Lower Platte River near Ashland. It is believed that in addressing the water supply shortages in the Lower Platte River, ancillary benefits to the remaining sectors would exist including: irrigation, power, environmental, and recreational. The "Drought Triggers" table below identifies four drought levels recommended for the Drought Plan (mild drought, moderate drought, severe drought, and extreme drought) as well as the associated index ranges that define these levels.

DROUGHT MONITORING CONTINUUM

DROUGHT TRIGGERS

CATEGORY	LEVEL	PALMER DROUGHT SEVERITY INDEX (PDSI)	PLATTE RIVER STREAM FLOW AT ASHLAND
Mild Drought	0	-1.0 to -1.99	
Moderate Drought	1	-2.0 to -2.99	3,000-1,500 cfs
Severe Drought	2	-3.0 to -3.99	1,500-500 cfs
Extreme Drought	3	-4.0 and below	Less than 500 cfs

Notes: PDSI = Palmer Drought Severity Index

The following lists the levels of drought, remaining consistent with the US Drought Monitor definitions of drought.

- A Level 0, "Abnormally Dry" [1] indicates an area may be experiencing "short-term dryness slowing planting, growth of crops or pastures" indicating the onset of drought or may be coming out of drought and experiencing lingering effects of drought.
- A Level 1, "Moderate Drought" involves "some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; and voluntary water-use restrictions requested."
- A Level 2, "Severe Drought" means that "crop or pasture losses likely; water shortages common; and water restrictions imposed."
- A Level 3, "Extreme Drought" involves "major crop/pasture losses" and "widespread water shortages or restrictions."

[1] *An "Abnormally Dry" classification by the National Drought Monitor corresponds to a PDSI "mild drought" classification.*