

PUBLIC WORKS MEMORANDUM
#14-2021

DATE: April 12, 2021

TO: Honorable Mayor Meredith Leighty and City Council Members

THROUGH: Heather Geyer, City Manager *Hmg*

FROM: Kent Kisselman PE, Director of Public Works *KHK*
Tamara Moon, Environmental Manager

SUBJECT: CR-41 – Drought Mitigation and Response Plan Adoption

PURPOSE

To consider CR-41, a resolution adopting the Drought Mitigation and Response Plan.

BACKGROUND

At the April 5, 2021 study session, staff presented the Drought Mitigation and Response Plan. This plan provides tools and guidance for responding to drought conditions within the City of Northglenn or in the City's water supply area.

The Drought Mitigation Plan designates four drought stages that can be declared by City Council when necessary, and recommended actions that can be implemented during each drought stage to reduce water use within the City, providing a sustainable water supply for health and safety during times of drought.

Once adopted, this plan will be filed with the Colorado Water Conservation Board, allowing the City to access grant and loan funds for implementing conservation and drought mitigation activities and infrastructure.

BUDGET/TIME IMPLICATIONS

There are no financial impacts to the City.

STAFF RECOMMENDATION

Staff recommends approval of CR-41.

STAFF REFERENCE

If Council members have any questions, please contact Kent Kisselman, Director of Public Works, at kkisselman@northglenn.org or 303.450.4005.

CR-41 – Drought Mitigation and Response Plan Adoption
Drought Mitigation and Response Plan

SPONSORED BY: MAYOR LEIGHTY

COUNCILMAN'S RESOLUTION

RESOLUTION NO.

No. CR-41
Series of 2021

Series of 2021

A RESOLUTION ADOPTING A DROUGHT MITIGATION AND RESPONSE PLAN FOR THE CITY OF NORTHGLENN

WHEREAS, drought is a part of Colorado’s climate and can significantly reduce available municipal water supplies, making it imperative for municipal water providers to anticipate and plan for droughts; and

WHEREAS, the City of Northglenn has developed a water supply system to meet the needs of its water customers and recognizes the importance of planning and monitoring water supplies and uses; and

WHEREAS, municipal drought planning is intended to preserve essential public services and minimize the adverse effects of a water supply shortage on public health and safety, economic activity, environmental resources, and individual lifestyles; and

WHEREAS, a drought management plan defines when a water supply shortage exists and measures to be taken to avoid, minimize, or mitigate the risks and impacts of drought-related water shortages; and

WHEREAS, City of Northglenn Water Resources staff and the Drought Response Committee have developed a Drought Mitigation and Response Plan to include strategies to respond systematically and proactively to periods of real or potential water shortages.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF NORTHGLENN, COLORADO, THAT:

Section 1. The Drought Mitigation and Response Plan, attached hereto as Exhibit 1, is hereby adopted for the City of Northglenn, Colorado.

DATED at Northglenn, Colorado this _____ day of _____, 2021.

MEREDITH LEIGHTY
Mayor

ATTEST:

APPROVED AS TO FORM:

JOHANNA SMALL, CMC
City Clerk

COREY Y. HOFFMANN
City Attorney



Drought Mitigation and Response Plan

CITY OF NORTHGLENN
PUBLIC WORKS



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Executive Summary

The City of Northglenn (Northglenn, or City) provides water to over 38,000 residents and seeks to ensure a sustainable supply even during periods of shortage such as drought. This Drought Mitigation and Response Plan was developed in order to respond systematically and proactively to periods of real or potential water shortages. Effective implementation of the plan components will require communication and collaboration among City departments and strong communication with the City’s water customers. This plan outlines a series of drought stages, each with individual indicators and response measures. Water Resources staff, along with members of the Drought Response Committee will use this document to recommend, for City Council approval, activation of various drought stages when appropriate criteria are met. Responses to drought also depend upon long-term conservation and water supply planning outlined in the City’s Water Efficiency Plan and Integrated Water Resources Plan. These documents encourage efficient water use at all times and establish the “normal” water supply conditions for the City.

1. Introduction

1.1 Profile of Northglenn’s Water Supply System

The City of Northglenn is located in western Adams County, Colorado, approximately 10 miles north of Denver. Northglenn was incorporated in 1969 and Northglenn’s municipal water system was established in 1980. By 2019, Northglenn was providing a population of 38,608 residents with water and wastewater services. Northglenn is a multi-use community consisting of open space, residential and industrial areas, schools, and commercial space (Figure 1: Map showing the location of Northglenn on the Front Range of Colorado and). In addition to Northglenn proper, the City also owns a parcel of land referred to as “Section 36” that is located north of the City in Weld County upon which Northglenn’s wastewater treatment plant is located.

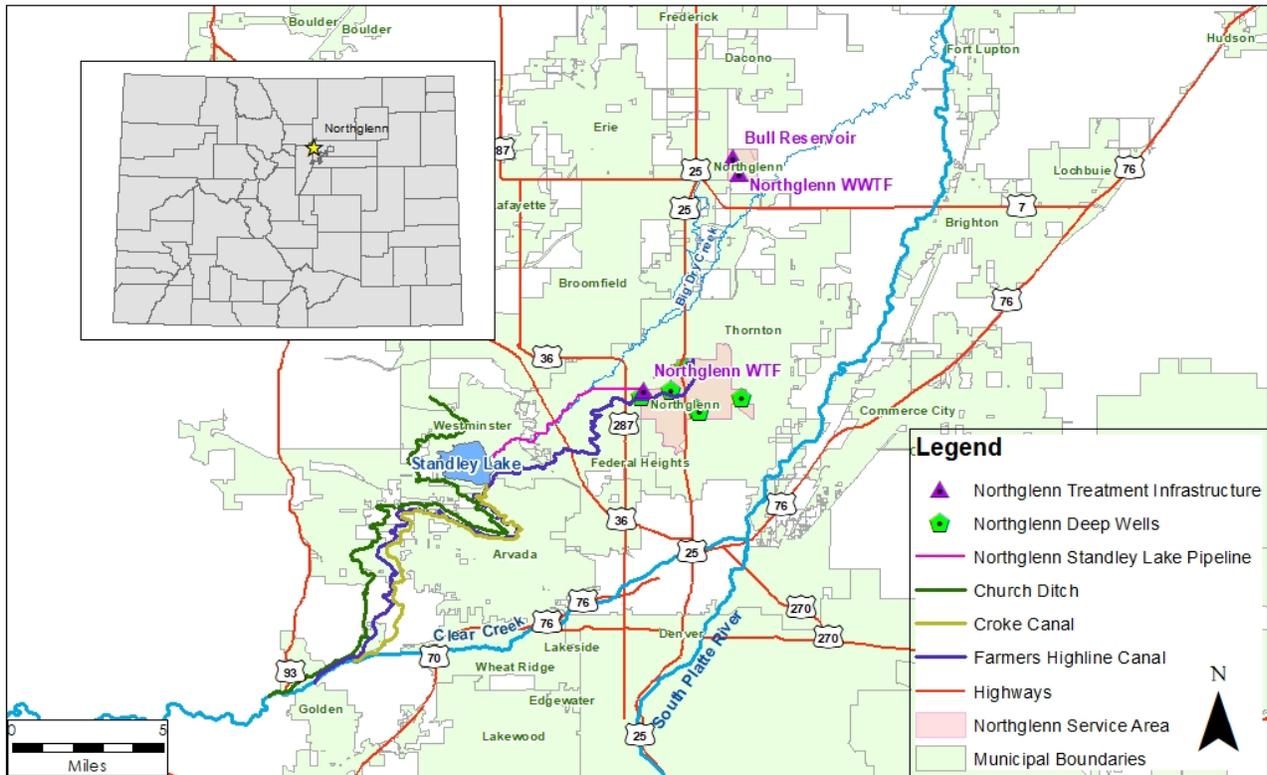


Figure 1: Map showing the location of Northglenn on the Front Range of Colorado and basic components of the water supply system

Northglenn’s water supply portfolio consists mainly of water rights from Clear Creek and storage capacity in Standley Lake. Water is delivered from Standley Lake to the Terminal Reservoir adjacent to Northglenn’s Water Treatment Facility (WTF) where most water is stored for use by the WTF. Some untreated water is delivered to Northwest Open Space for irrigation. Northglenn’s water portfolio also includes five deep-wells in the Laramie-Fox Hills and Arapahoe Aquifers, some South Platte water rights, and storage of treated wastewater effluent in Bull Reservoir, all of which are used to meet downstream return flow obligations and cannot currently be used to supply the Water Treatment Facility.

1.2 Drought Mitigation and Response Plan

Drought occurs when below-average precipitation, below-average streamflow, or low levels of raw water storage result in a gap between water supply and water demand. Drought is a normal part of Colorado’s climate and requires thoughtful planning of water supplies and uses.

The Drought Mitigation and Response Plan (Plan) outlines guidelines, rules, and procedures the City of Northglenn will use to manage water supply and water use during drought. The Drought Mitigation and Response Plan is designed to preserve health, safety, and vitality of the community, and to avoid or minimize adverse impacts to City services, community quality of life, and individual water customer needs.



The Drought Mitigation and Response Plan is intended to provide a framework for timely identification of oncoming drought, identify the responses necessary to prevent drought conditions from worsening, and establish benchmarks to track the effectiveness of drought response measures. The Plan is intended to support decision making during times of drought and allows for responses to be tailored to each unique set of drought conditions.

This plan will be updated regularly to ensure it captures lessons learned from previous drought responses and accurately reflects current conditions in the City of Northglenn.

1.3 Definitions

SWE – Snow Water Equivalent, represents the amount of liquid water present in the snowpack, usually reported in inches

AF – Acre-foot, a volume of water that covers one acre, one foot deep; approximately the amount of water used by two households in one year

Seasonal Use – water that is used in the growing season primarily for outdoor irrigation, also known as outdoor use

Non-seasonal use – also known as indoor use (sometimes called base use); this is water used for showers, toilets, cooking, and drinking, among other uses

SWSP – Substitute Water Supply Plan, a temporary change to a water right that is filed with the State Engineer’s office (Division of Water Resources)

2. Stakeholders, Objectives, and Principles

2.1 Drought Response Committee

Drought mitigation planning and response implementation is an effort that requires a diverse team of City staff from multiple departments. Implementing the Drought Mitigation and Response Plan will cause impacts that may affect a wide variety of City departments, residents, businesses, and community stakeholders.

During the development of this plan a Drought Response Committee (DRC) was formed to review components of the draft Plan and provide feedback. Committee members (*Table 1: Northglenn Drought Response Committee Participants*) were selected and invited by City of Northglenn Public Works Department staff based on their experience and position, and included representatives from a range of City departments that may be impacted by the implementation of the Plan.

Department/Division	Name	Position
Public Works	Sophie Porcelli	Water Resources Administrator
Public Works	John Crawford	Water Resources Analyst
Public Works	Tamara Moon	Environmental Manager
City Manager’s Office	Rupa Venkatesh	Assistant to the City Manager
Public Works	Jason Hensel	Operations Manager/Utilities
Public Works	Shaun Hollstrom	Chief Plant Operator
Communications	Diana Wilson	Communications Director



Code Enforcement	Tom Carlson	Neighborhood Services Supervisor
Public Works	Robert Webber	Operations Manager
Economic Development	Debbie Tuttle	Economic Development Director
Finance	Debbie Staub	Revenue Supervisor
Parks, Recreation, and Culture	Doug Kegerreis	Parks Supervisor
Parks, Recreation, and Culture	Amanda Peterson	Director of Parks, Recreation, and Culture
Parks, Recreation, and Culture	Darren Burke	Parks Maintenance Worker

Table 1: *Northglenn Drought Response Committee Participants*

Following the creation of Northglenn’s Drought Mitigation and Response Plan, the DRC will meet periodically to review current drought conditions, prepare for the declaration of drought stages, and ensure Plan implementation is effective. Additional Northglenn staff members can be added to the DRC as needed. At a minimum, the DRC will meet once per year in February or March to review water supply conditions for the coming year. Additional meetings will be scheduled as necessary if concerns about impending or current drought arise, or to coordinate drought response implementation.

2.2 Objectives, Priorities, and Operating Principles

Northglenn’s Drought Mitigation and Response Plan establishes policies and procedures to be used in the event of drought, water shortages, or delivery limitations in the water supply. The Plan shall apply to all water customer types including single family, townhome, apartments, commercial and industrial, City facilities, and schools.

The objectives of this plan are the following:

- Proactively predict and determine the onset and severity of oncoming drought by monitoring available water supply, climatic and hydrologic indicators, and other relevant information.
- Reduce water demand and efficiently use existing water supplies to maintain health and safety, essential public services, community vitality, and resiliency to the extent possible during a water shortage.
- Minimize adverse effects of drought response actions to City services, economic activity, environmental resources, and individual lifestyles.

Drought may create situations where Northglenn’s water supply is temporarily unable to meet all water demand. During times of shortage water uses will be prioritized in the following order as shown in Table 2.



Priority	Water Use	Description
1	Health and Sanitation	All indoor sanitary uses including drinking water, cooking, and cleaning for all customer types. Firefighting and hydrant flushing (as needed for health and safety) included
2	Business and Community Needs	Non-sanitary indoor uses and outdoor uses for commercial and business purposes including commercial car washing and indoor public pools.
3	High Priority Outdoor Use	Sports fields, high priority public parks, public pools, trees, and vegetable gardens
4	Low Priority Outdoor Use	Turf grass, water features, and private pools

Table 2: *Priority of Water Use During Times of Shortage.*

3. Historical Drought and Impact Assessment

Northglenn’s water supply system has likely experienced multiple single-year hydrologic droughts including in 2002 and 2013. Drought has only been declared once, in 2002, which resulted in mandatory conservation actions targeted at water customers. Drought conditions were predicted in the spring of 2002 and the City pushed for drought restrictions before the summer irrigation season. The Church Ditch, which conveys much of the spring runoff into Standley Lake only ran for 30 days, resulting in a low total summer fill. In general, there was good buy-in from water customers regarding conservation and overall water use appears to have decreased in response to drought restrictions. It is believed that strong, consistent regional messaging from water providers like Northglenn, Denver Water, and Westminster contributed to a wide acknowledgement of water scarcity during 2002. The primary conservation action in 2002 was address-based watering restrictions that were enforced by all City staff through notices and violation warnings, which were then forwarded to Code Enforcement staff for follow-up and compliance. Other restrictions included a ban on car washing and limits on total irrigation uses. The address-based watering restrictions created challenges for the operation of Northglenn’s water treatment plant and it is recommended that this approach be adjusted in the future to minimize operational challenges. The 2002 drought abruptly ended following a very large snowfall event in the Front Range and Clear Creek watershed in March 2003.

4. Drought Mitigation and Response

Drought mitigation measures are implemented following the declaration of drought conditions in Northglenn, which would typically occur in May (or earlier). Changes in the drought declaration can occur at any point in the year. Northglenn has both an active water conservation program currently in place, and an expansion of that program outlined in the 2020 Water Efficiency Plan that may reduce negative impacts during drought periods. However, additional water savings measures may be necessary when drought has been declared to respond to emergency water shortage conditions. Mitigation of drought has two response categories; the first category consists of supply-side measures, and the second category is a set of responses that target water demand within the Northglenn service area. As a result of limitations of infrastructure,



hydrology, and legality, Northglenn has limited ability to impact drought conditions through supply-side measures. Supply-side response strategies can lead to targeted improvements (primarily for City use), but may not be sufficient to improve water shortages in the water supply as a whole. Demand-side strategies, particularly those that reduce seasonal outdoor use, offer the most promise for drought mitigation and as a result most of the responses recommended by this Plan rely on water demand reduction.

4.1 Supply-Side Mitigation and Response Strategies

During times of drought, the following supply-side mitigation and response strategies will be considered:

- Northglenn possesses a number of deep, non-tributary groundwater wells in the Laramie-Fox Hills and Arapahoe Aquifers that could be activated for emergency use. Many of the wells are in disrepair, and do not have a substantial history of use. Therefore, substantial retrofitting and infrastructure improvements would be needed to draw on this groundwater resource during a drought. Ongoing projects to improve the well infrastructure may allow for this supply to be an effective drought measure in the future.
- Deep non-tributary groundwater could also be used for limited irrigation of City-owned properties where raw water treatment is not necessary. The necessary infrastructure and operation of groundwater wells in connection to City irrigation systems requires further investigation and the feasibility of this measure is currently unknown.
- The City of Northglenn holds a limited number of shares in the Farmers' High Line Canal (FHLC) irrigation canal that conveys water through the City of Northglenn. FHLC water is infrequently used to manage water levels in Webster Lake at E.B. Rains Jr. Memorial Park. Under drought conditions, FHLC share water and water stored in Webster Lake could be used for irrigation of E.B. Rains Jr. Memorial Park or other City-owned properties. Like the non-tributary groundwater wells, the feasibility of connecting this water resource to irrigation systems requires further investigation and its effectiveness is not yet known.
- As part of Northglenn's Integrated Water Resources Plan, ongoing expansion of water rights, water storage, and other water supplies is a priority for Water Resources staff. However, during periods of regional drought, it is likely that additional supplies of water will be unavailable for lease or purchase. Therefore, expansion of water supplies in periods of drought is not likely to provide measurable benefits in the near-term.
- Northglenn has a portfolio of water rights and storage rights in Standley Lake. A portion of these water rights are currently decreed for irrigation and have not yet been through the State of Colorado Water Court process to have their beneficial use changed from 'irrigation' to 'municipal' uses. Water rights decreed for irrigation are typically unavailable for delivery to the Northglenn Water Treatment Facility for distribution to water customers. In case of an emergency, Northglenn may file an emergency Substitute Water Supply Plan (SWSP) that could temporarily allow for municipal use of water rights decreed for irrigation. In a drought emergency, this measure may be required to ensure continuity of water supplies for indoor uses that benefit human health and safety.



4.2 Demand-Side Mitigation and Response Strategies

Approximately 42% of Northglenn's annual water demand is from seasonal, outdoor use. Much of this outdoor demand goes to irrigation of turf grass and other water-intensive landscaping. Reducing irrigation of turf and other landscape elements has the potential to dramatically reduce water demand at both seasonal and annual time scales. Voluntary restrictions may not substantially change seasonal water demands. However, mandatory watering restrictions can result in substantial (but variable) water savings during drought periods in communities like Northglenn¹.

While reductions in indoor water use are difficult to achieve in the near-term, and water used indoors is considered to be an inelastic good, outdoor water uses can be expected to respond to market signals such as price increases. Examples of price increases that could be implemented during drought periods are drought fees and rate surcharges. Rate surcharges that focus on increasing prices for water used in excess of indoor needs have the benefit of rewarding customers having relatively efficient water use with consistently less expensive water bills. Surcharges also convey scarcity to water customers having excessive water use during drought periods. Drought fees may not always lead to behavioral change for individual high water users but can be used to stabilize revenue during drought periods. Drought surcharges are described explicitly in Northglenn's Municipal Code². Future consideration of increasing or restructuring drought surcharges may substantially increase the effectiveness of demand-reducing drought response measures.

When drought is declared, Northglenn staff may consider using customer billing data and other property information to identify high water use customers for further outreach and communication. For example, single family homes that are in the top 10 percentile of use may be identified for mailing of conservation information packets that describe irrigation audits (available to customers through Resource Central), turf removal rebates, and general information about water conservation in Northglenn. Large water savings could be wrought by converting high-water use customers into typical users. Targeted water savings approaches need to consider customer categories (eg. commercial vs. single family home or apartment), and the ability or willingness of customers to make substantive behavioral changes.

While seasonal irrigation is believed to be the main use of water outdoors, restrictions on other outdoor uses may be considered during drought periods in order to accrue additional water savings. In the case of a drought Emergency, curtailing wasteful practices may be especially beneficial in an absolute sense. Northglenn may consider reducing outdoor uses such as non-commercial car washing, outdoor cleanup using water and pressurized cleaning devices, use of fire hydrants for non-emergency use, and filling of water features such as ponds, waterfalls, and pools.

¹ Kenney et al. (2004). Use and effectiveness of municipal water restrictions during drought in Colorado. Journal of the American Water Resources Association (JAWRA)

² Section 16-10-4. Utility Usage Charges--Fresh Water



5. Drought Stages, Response Targets, and Monitoring

5.1 Drought Stages and Response Targets

Northglenn has five drought condition stages starting with “Normal” which describes typical conditions and does not require additional actions beyond ongoing water conservation programs (Table 3: *Drought stage water conservation response targets*). Stage 1 (Voluntary Restrictions) is designed to increase communications and conservation outreach and prepare water customers for potential future restrictions. Use reduction and watering restrictions are voluntary at this stage. Stages 2 (Mandatory Restrictions) and 3 (Turf Irrigation Ban) require increasing water use reductions, and the “Emergency” stage (Stage 4) prioritizes essential water uses for human health and safety. Each drought stage has a set of drought indicators that include current and forecasted water storage, drought indices, and regional forecasts of hydrologic conditions. City Council may declare drought conditions at any time. Regular reassessment during drought periods is also required. No single drought indicator will be used to declare a drought. Rather, multiple indicators will be evaluated together to make recommendations for declaration of drought (or movement among drought stage declarations).

Response targets are an important component of drought management and are used to gauge the effectiveness of conservation measures and guide decisions to move among drought stages (or remove drought restrictions). Water conservation targets range from minimal (Voluntary Restrictions), to increasing reductions of outdoor (seasonal) water use in the summer months (Table 3: *Drought stage water conservation response targets*). Only under the very unlikely and severe conditions of a drought Stage 4 (Emergency Rationing) will non-seasonal (indoor) water use reduction targets be implemented. Water use reductions in Stages 2 (Mandatory Restrictions) and 3 (Turf Irrigation Ban) consider the potential for multi-year drought and aim to minimize negative impacts to Northglenn community members and prevent the need to declare more serious stages of drought and implement more severe water use restrictions.

Water Resources staff will monitor the effectiveness of drought implementation after drought has been declared and will compare water use reduction goals with actual water use. The citywide adherence to reduction goals will be used to recommend changes to drought declarations and restrictions.



Drought Stage	Stage 1: Voluntary Restrictions	Stage 2: Mandatory Restrictions	Stage 3: Turf Irrigation Ban	Stage 4: Emergency Rationing
Annual Reduction Goal	0-5%	23%	47%	60%
Seasonal Use Reduction Goal	0-10%	37%	73%	100%

Table 3: *Drought stage water conservation response targets*

5.2 Monitoring of Drought Indicators

Northglenn Water Supply Storage and Predicted Storage

Northglenn has developed a predictive water supply storage model that is used to forecast total storage in Standley Lake in June, which is typically the month of maximum storage. The model is based on the previous month's storage and the seasonality and trends in storage over time. Storage thresholds for the four stages of drought are given in Figure 2: June storage ranges in Standley Lake used to indicate and trigger Northglenn drought stages. Water Resources staff monitor the storage forecast model in the winter and spring ahead of peak runoff to prepare for potential drought responses.

Following a drought declaration in May (or before), Water Resources staff will monitor water production at the Water Treatment Facility and assess the effectiveness of conservation actions by comparing to historical weekly (or monthly) averages. Moving to a more severe drought stage declaration may be indicated after June by failure to reach conservation targets in Table 3: *Drought stage water conservation response targets*.

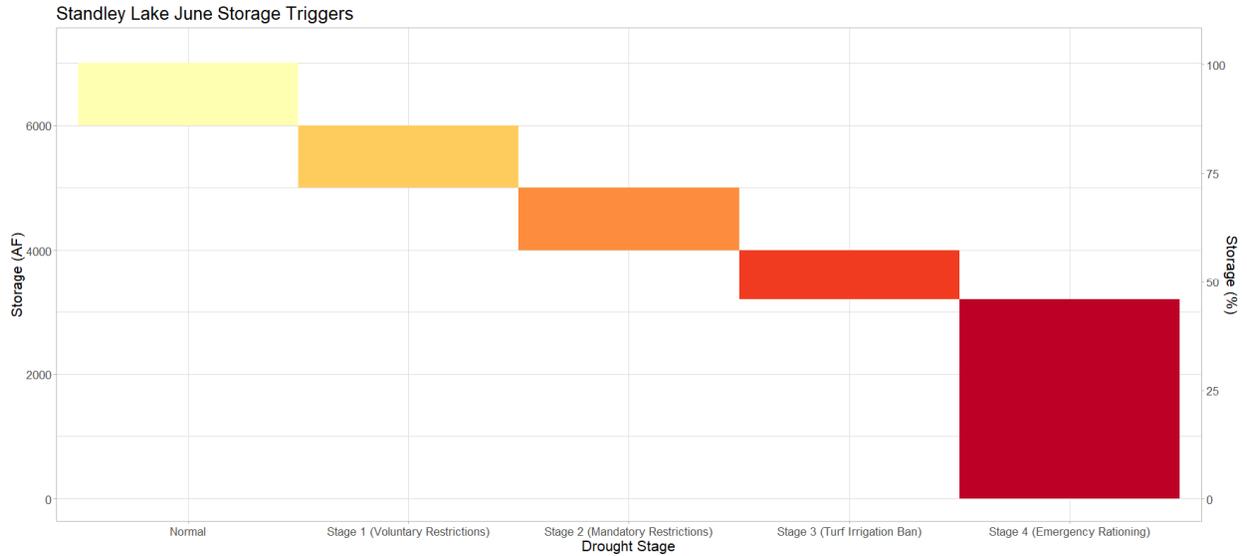


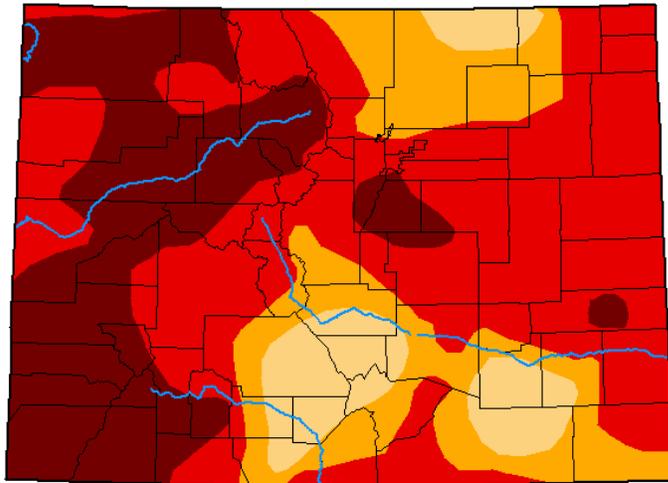
Figure 2: June storage ranges in Standley Lake used to indicate and trigger Northglenn drought stages

Water Resources staff monitor the US Drought Monitor (see Figure 3: US Drought Monitor map of Colorado in January 2021 showing extensive drought throughout the state and extreme conditions in Northglenn’s water supply watersheds) which provides a summary of the current drought conditions in the State of Colorado and in the watersheds that supply water to Standley Lake (primarily Clear Creek). The Drought Monitor is useful for communicating and understanding regional and widespread drought and provides a narrative description of the severity of current drought conditions.



U.S. Drought Monitor Colorado

January 12, 2021
(Released Thursday, Jan. 14, 2021)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	91.03	73.63	27.59
Last Week 01-05-2021	0.00	100.00	100.00	93.73	76.17	27.60
3 Months Ago 10-13-2020	0.00	100.00	100.00	97.23	59.23	16.72
Start of Calendar Year 12-29-2020	0.00	100.00	100.00	93.73	76.17	27.60
Start of Water Year 09-29-2020	0.00	100.00	99.29	89.35	52.88	2.64
One Year Ago 01-14-2020	31.72	68.28	51.19	13.84	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Deborah Bathke
National Drought Mitigation Center



droughtmonitor.unl.edu

Figure 3: US Drought Monitor map of Colorado in January 2021 showing extensive drought throughout the state and extreme conditions in Northglenn’s water supply watersheds

Seasonal Drought Outlook

The Seasonal Drought Outlook map (Figure 4: US Seasonal Drought Outlook from the National Weather Service’s Climate Prediction Center showing persistent drought throughout the Southwest and all of Colorado in early 2021) provides a useful indication of how drought conditions are likely to change in the near future. The projections can be useful for determining whether low water storage conditions are likely to persist in the near term. The drought outlook can also be used for decisions to change drought stages or to rescind drought restrictions entirely. The seasonal outlook is based on short- and long-range forecasts that are based on statistical and dynamic models.

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for December 17, 2020 - March 31, 2021
Released December 17, 2020

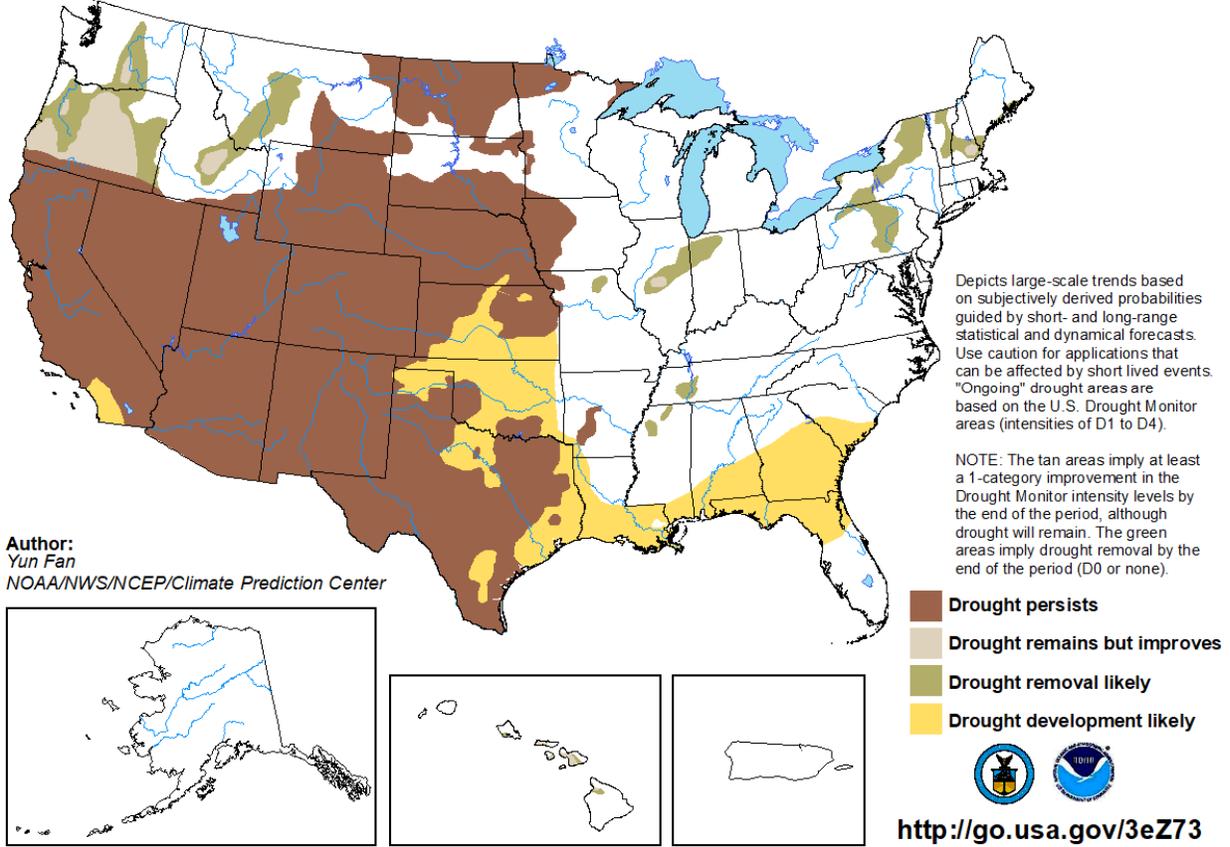


Figure 4: US Seasonal Drought Outlook from the National Weather Service's Climate Prediction Center showing persistent drought throughout the Southwest and all of Colorado in early 2021

Colorado Reservoir Storage (% of useable storage by basin)

Regional coordination of drought communications and restrictions is needed for effective implementation of the drought plan. Therefore, indicators of regional water supply conditions, such as the Colorado Reservoir Storage graphs (Figure 5), provide context for Northglenn water supply conditions and drought indicators. When other water providers' supplies in the South Platte basin show below average storage, we can expect senior water rights to be called into priority, which has the potential to limit Northglenn's ability to store water in Standley Lake. Further, limited regional water supply indicates that little extra water could be available for lease.

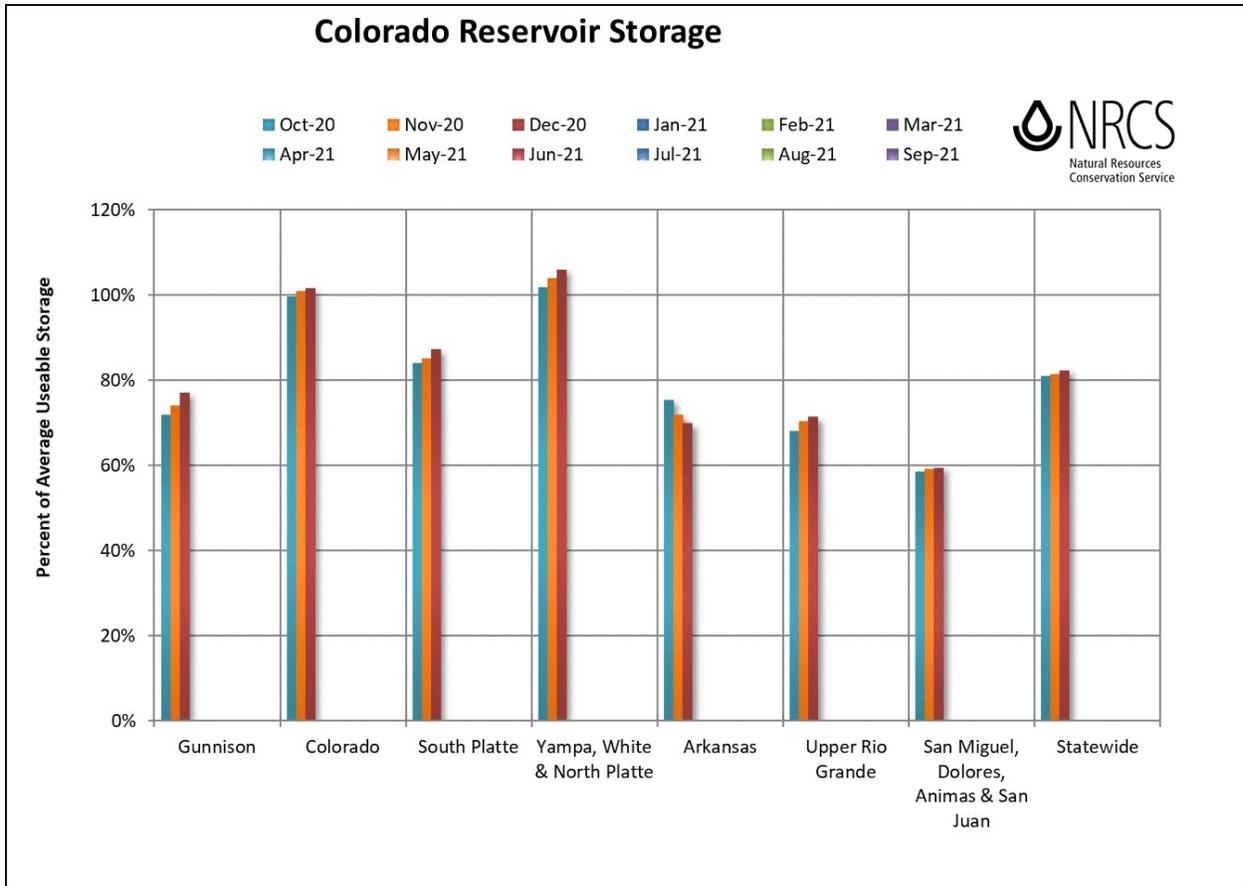


Figure 5: Figure showing the average storage in Colorado reservoirs grouped by major river basin; data shown for WY2021 through January indicate below average storage that has improved slightly over time in the South Platte basin

Streamflow Forecast Maps

Forecasts of monthly streamflow available from National Resources Conservation Service (Figure 6: Map showing forecasted streamflow in Colorado for January 2021) are based on statistical models that include snow water equivalent (SWE), precipitation, and antecedent streamflow, among others. Below average forecasted streamflow would indicate that current storage and drought conditions are unlikely to improve in the South Platte basin.

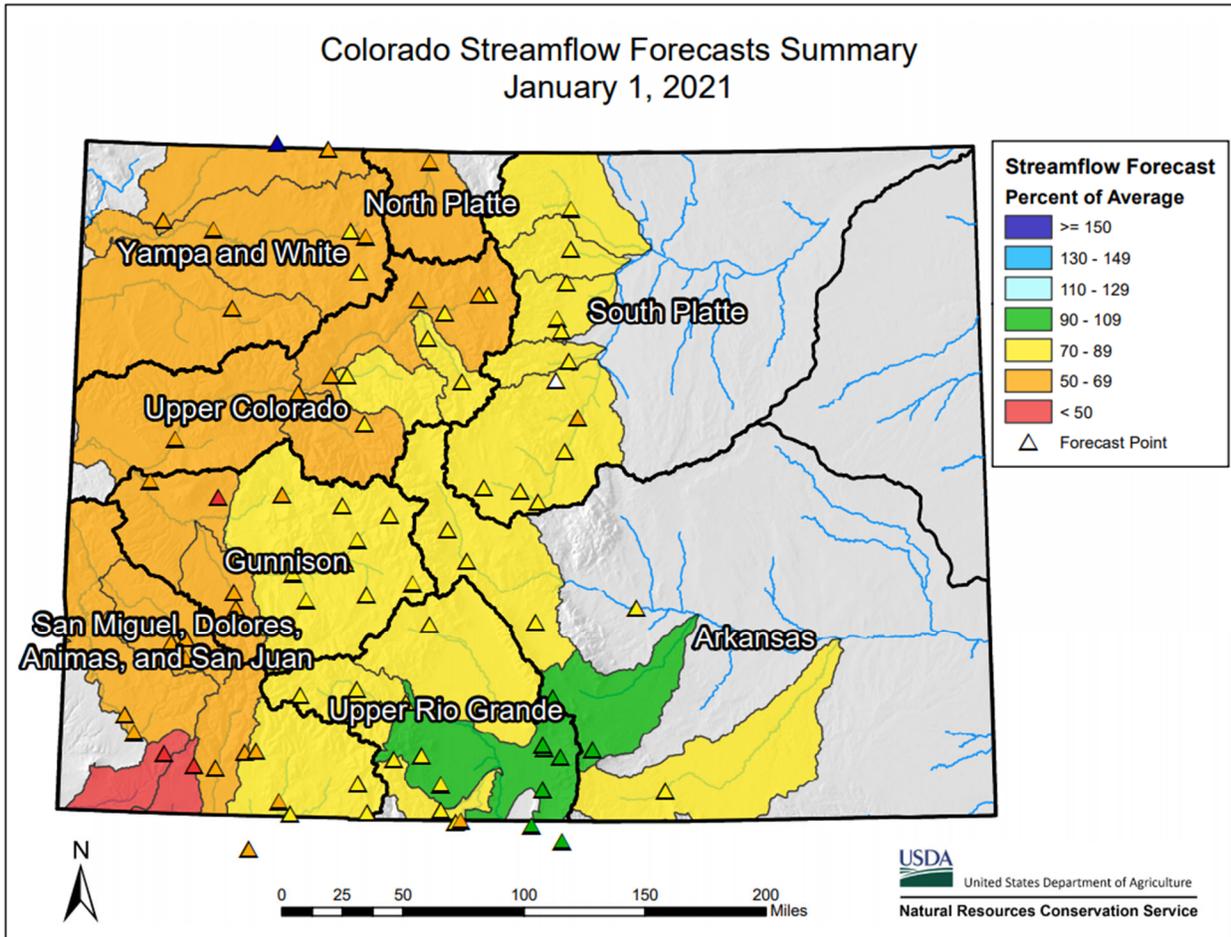


Figure 6: Map showing forecasted streamflow in Colorado for January 2021

Snow Water Equivalent (SWE)

Since the majority of water supplies for Northglenn are derived from winter snowpack in the mountains to the West, SWE is a good indication of water that might be available during spring/summer runoff. Water Resources staff monitor the progression of basin-wide SWE accumulations (Figure 7: Screenshot of interactive map showing the Snow Water Equivalent at SNOTEL stations in watersheds to the west of the Front Range of Colorado), and focus on SWE accumulation at the Berthoud Pass, and Loveland Basin (Figure 8: Graph of Snow Water Equivalent at the Loveland Basin station in the Clear Creek watershed from January 2021) SNOTEL sites. In some years, low wintertime SWE has returned to normal (or above normal) following large spring snow storms. Therefore, the monitoring of SWE becomes more important for decision making in the spring months.

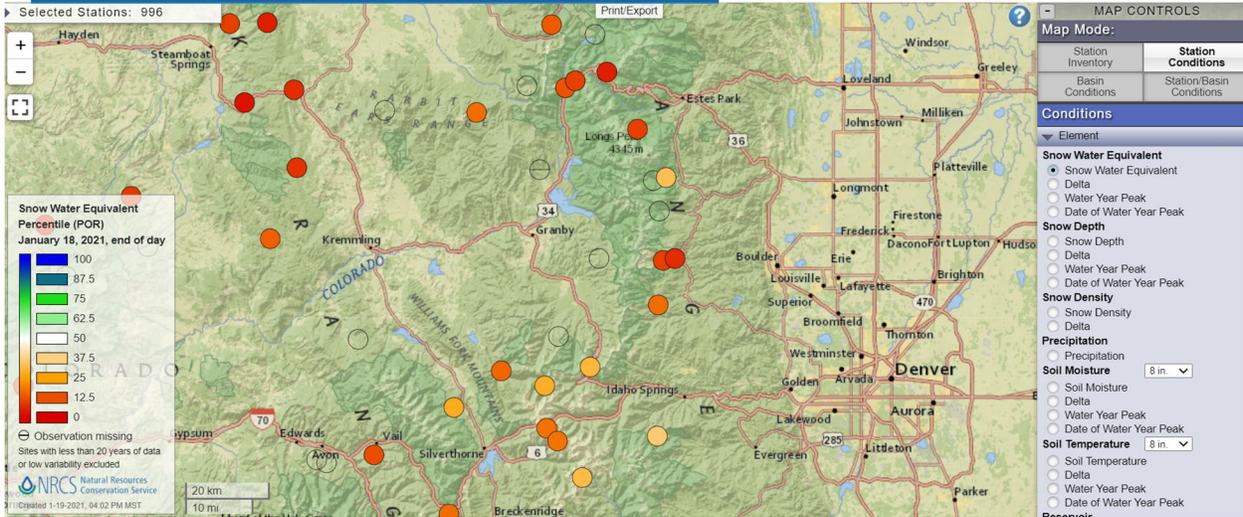


Figure 7: Screenshot of interactive map showing the Snow Water Equivalent at SNOTEL stations in watersheds to the west of the Front Range of Colorado

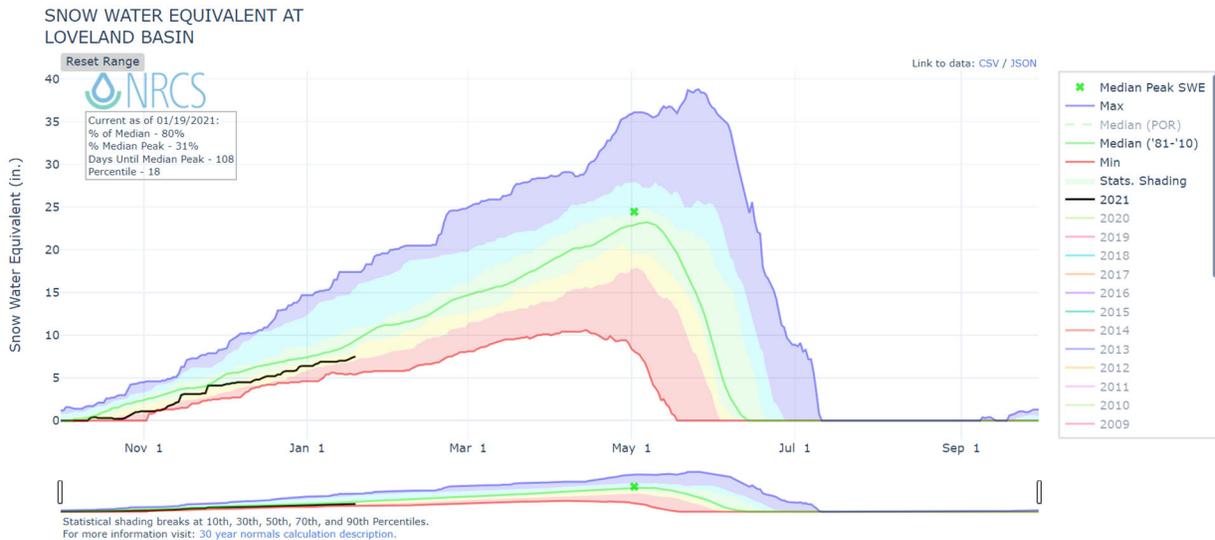


Figure 8: Graph of Snow Water Equivalent at the Loveland Basin station in the Clear Creek watershed from January 2021



5.3 Monitoring References and Resources

Ongoing monitoring of drought and water supply conditions will be supported with the following resources:

- US Seasonal Drought Outlook:
https://www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.png
- Colorado Streamflow Forecast Maps:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/co/snow/waterproducts/forecasts/?cid=nrcs144p2_063227
- SWE at Loveland Basin:
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/siteCharts/POR/WTEQ/CO//Loveland%20Basin.html
- Colorado Reservoir Storage:
https://www.wcc.nrcs.usda.gov/ftpref/states/co/resv/state/monthly/co_resv_pct.gif
- Colorado Drought Monitor:
<https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CO>

6. Staged Drought Response Program

Northglenn's staged drought response program identifies the common indicators that will be considered to declare drought stages, as well as a set of drought response measures that can be implemented to respond to each level of drought and achieve target water saving reductions. Both the common indicators and common response measures are designed to be used as guidance for decision making in response to water shortage. Not all relevant indicators must be reached before drought can be declared and similarly not all response measures may be necessary to achieve target water savings. The City may modify response as needed during times of drought to adequately address each drought's unique challenges.

6.1 Normal Conditions

Normal or near-average conditions do not require additional action from City or Water Resources staff. Efficient use of water and water conservation are always important in Northglenn, and Northglenn's Waste of Water Ordinance³ is always in effect.

Common Indicators

- Near average or above storage in Standley Lake in June and proceeding months.
- Non-drought conditions according to the U.S. Drought Monitor (labeled none or possibly D0 "Abnormally Dry").
- No indication of drought development in Colorado or South Platte basin according to the U.S. Seasonal Drought Outlook.
- Near average or above reservoir storage in the South Platte basin.
- Near average or above streamflow forecasts for the South Platte basin.

³ https://www.northglenn.org/public_safety/code_enforcement/article_16-24.php



- Near average or above snowpack in the Clear Creek watershed and Berthoud Pass as measured by the snow water equivalent (SWE).

Common Response Measures

- Ongoing water conservation programs will be offered and conservation program expansion outlined in the Water Efficiency Plan will continue.
- All terms defined by Municipal Code Article 16-24 'Waste of Water Prohibited' are mandatory at all times.

6.2 Stage 1: Voluntary Restrictions

Stage 1: Voluntary Restrictions indicates the potential for extended drought that could worsen the water supply-demand gap. A declaration of Stage 1 is expected to result in marginal water savings (0-10% of total Northglenn water use) as there are no mandatory restrictions in this phase. The main goals of this phase are to educate water users on water conservation by increasing communications and outreach efforts and to prepare Northglenn City staff, leadership, and the community for more severe drought measures.

Common Indicators

- Below average storage in Standley Lake in June within the range of 5,000 to 6,000 acre feet (AF).
- Drought conditions as indicated by the U.S. Drought Monitor, D1 (Moderate Drought) or worse.
- Multi-year drought is possible.
- Drought is likely to develop or remain in Colorado and the South Platte basin according to the U.S. Seasonal Drought Outlook.
- Below average reservoir storage in the South Platte basin.
- Below average streamflow forecasts for the South Platte basin.
- Below average snowpack in the Clear Creek watershed and Berthoud Pass as measured by the snow water equivalent (SWE).

Common Response Measures

- Increase communications and outreach regarding conservation actions that can lead to measurable water savings.
- Increase communication and outreach regarding drought conditions and value of water.
- Target outreach to high water users as identified through billing data and geographic information system-based water budgets.
- Increase marketing of Northglenn water conservation programs such as rebates and services provided by Resource Central.
- Request customers limit irrigation of turf to two or three days per week. Watering days may be selected by customers.
- Encourage postponing new landscape installation unless converting to xeriscape.



- Request that City facilities including Parks create plans to reduce water consumption by 10% immediately, create plans to reduce outdoor water demand by 40% and 90% should further drought declarations be necessary.

6.3 Stage 2: Mandatory Restrictions

Stage 2: Mandatory Restriction conditions indicate a situation where typical water demand is likely to be greater than available supplies, thus requiring restrictions on water use. Under Stage 2: Mandatory Restrictions, the City will expand upon outreach and education efforts implemented during Stage 1: Voluntary Restrictions. Outdoor water use will be restricted and restrictions will be enforced by Neighborhood Services.

Common Indicators

- Well below average storage in Standley Lake in June with a range of 4,000 to 5,000 AF.
- Extreme-exceptional (D3-D4) drought conditions as indicated by the U.S. Drought Monitor.
- Multi-year drought is predicted.
- Drought conditions persist in Colorado according to the U.S. Seasonal Drought Outlook.
- Well below average reservoir storage in the South Platte basin.
- Well below average streamflow forecasts for the South Platte basin.
- Well below average snowpack in the Clear Creek watershed and Berthoud Pass as measured by the snow water equivalent (SWE).
- Water conservation targets are not met according to the previous drought declaration (0-10% savings under Stage 1).

Common Response Measures

- Irrigation of existing lawns limited to 2 or 3 days per week and the City may designate irrigation days by property.
- Irrigation of existing flowers, vegetable gardens, shrubs and trees limited to 3 days per week.
- Reduce or cease irrigation at low traffic or low priority City parks and facilities.
- Integrate alternative water sources for City irrigation particularly considering the use of Farmers' High Line Canal water or the City's deep wells.
- Expand staff and resources for conservation outreach and water efficiency programs.
- Restrict or cease discretionary leases of Northglenn water to irrigators and other non-municipal users.
- Apply for Substitute Water Supply Plan (SWSP) to deliver water not decreed for municipal use from Standley Lake to the Water Treatment Facility.
- Add drought surcharges as defined in Municipal Code Article 16-10 'Rates and Charges'.
- Installation of new turf is prohibited.
- Delay non-turf landscape installation. Xeric landscape installation permitted.
- No car washing on private property. Commercial car washing permitted.



- Public facilities will be directed to implement water use restrictions including:
 - Implement cumulative water demand reductions of 40% at all City parks. Demand may be reduced by reducing irrigation at low-priority and low-traffic City parks and optimizing efficiency of systems at high-traffic and high priority City parks and facilities such as E.B. Rains Jr. Memorial Park and Northwest Open Space.
 - Reduce street washing to minimum level necessary to comply with air quality standards.
 - Suspend hydrant flushing unless necessary for health and safety.

6.4 Stage 3: Turf Irrigation Ban

Stage 3: Turf Irrigation Ban conditions indicate a severe strain on Northglenn's water supply that will require near total elimination of outdoor irrigation. These conditions are described by widespread drought indicators and very low storage in Standley Lake. Expanded reduction in low-priority water uses will be pursued. Under these conditions, turf and other high-water use landscaping elements will not be watered on City property or private property. While efforts to maintain established trees and non-turf landscaping may be allowed, loss of turf and some landscaping is expected.

Common Indicators

- Storage in Standley Lake is very low in June within a range of 3,200 to 4,000 AF.
- Extreme-exceptional (D3-D4) drought conditions as indicated by the U.S. Drought Monitor.
- Multi-year drought in progress.
- Drought conditions persist in Colorado according to the U.S. Seasonal Drought Outlook.
- Storage in South Platte reservoirs is very low.
- Streamflow forecasts for the South Platte basin are very low compared to the historical average.
- Very low snowpack in the Clear Creek watershed and Berthoud Pass as measured by the snow water equivalent (SWE).
- Water conservation targets are not met according to previous drought declaration (37% reduction of seasonal use under Stage 2).

Common Response Measures

- Irrigation of turf and annual landscaping is prohibited.
- Irrigation of established trees is permitted by hand, 2 days per week.
- Increase staff and resources for communication and enforcement of irrigation ban.
- Expand staff and resources for conservation outreach and water efficiency programs
- Add drought surcharges as defined in Municipal Code Article 16-10 'Rates and Charges'.
- Apply for Substitute Water Supply Plan (SWSP) to deliver water not decreed for municipal use from Standley Lake to Water Treatment Facility.



- Cease discretionary leases of Northglenn water to irrigators and other non-municipal users.
- Install flow restriction devices or shut off taps of non-compliant water users.
- Ban the installation of new turf and landscaping without special approval.
- No new or expanded water service connections permitted.
- No filling or refilling of private swimming pools permitted.
- No car washing on private property. Commercial car washing permitted.
- Public facilities will be directed to implement water use restrictions including:
 - Implement cumulative water demand reductions of 90% at all City parks.
 - Cease irrigation of turf at City parks and facilities.
 - Reduce street washing to minimum level necessary to comply with air quality standards.
 - Suspend hydrant flushing unless necessary for health and safety.

6.5 Stage 4: Emergency Rationing

Emergency conditions are extremely unlikely. Nonetheless, due to record setting drought, or infrastructure failure, rationing of City water supplies will be necessary to preserve human health and safety. No outdoor use will be allowed under an Emergency Rationing declaration and all City water users will need to significantly reduce indoor water uses.

Common Indicators

- Storage in Standley Lake is at all-time low, below 3,200 AF.
- Extreme (D4) drought conditions as indicated by the U.S. Drought Monitor.
- Drought conditions persist in Colorado according to the U.S. Seasonal Drought Outlook.
- Storage in South Platte reservoirs is at or near all-time lows.
- Streamflow is forecasted to be at or near all-time lows in the South Platte basin.
- Snowpack in the Clear Creek watershed and Berthoud Pass as measured by the snow water equivalent (SWE) is at or near all-time lows.

Common Response Measures

- All irrigation is prohibited.
- Increase staff and resources for communication and enforcement of irrigation ban.
- Increase staff and resources for monitoring and outreach to high water users for every billing cycle.
- Adopt additional tools and resources for leak detection within distribution system
- Expand staff and resources for conservation outreach and water efficiency programs.
- Add drought surcharges as defined in Municipal Code Article 16-10 'Rates and Charges'.
- Apply for Substitute Water Supply Plan (SWSP) to deliver water not decreed for municipal use from Standley Lake to Water Treatment Facility.



- Cease discretionary leases of Northglenn water to irrigators and other non-municipal users.
- Install flow restriction devices or shut off taps of non-compliant water users.
- Ban the installation of new turf and landscaping without special approval.
- No new or expanded water service connections permitted.
- No operation of public or private swimming pools is permitted.
- No car washing permitted.
- Upgrade City facilities to maximize water efficiency (e.g. water efficient toilets and other appliances).
- Public facilities will be directed to implement water use restrictions including:
 - Cease irrigation on all City property.
 - Reduce street washing to minimum level necessary to comply with air quality standards.
 - Suspend hydrant flushing unless necessary for health and safety.
- Additional restrictions of indoor water use may be considered as necessary to respond to water shortage conditions.

7. Implementation

7.1 Water Shortage Declarations

Northglenn's Municipal Code provides a process for declaration and implementation of drought. City Council approval is required to declare, advance, or de-escalate drought stages. Subsequently, the City Manager will promulgate and enforce rules and regulations that define response measures to be implemented under specific shortage circumstances. As described in Municipal Code Article 16-23-1 Drought and Other Water Shortages: "In the event of a drought or other water shortage, as declared by the City Council by resolution, the City Manager shall have the authority to promulgate rules and regulations governing water usage by all customers of the Northglenn water system." The City Manager and supporting staff will use the Drought Mitigation and Response Plan framework to inform drought declaration recommendations and select the specific set of response measures appropriate for individual drought conditions.

The City's Water Resources staff are primarily responsible for ongoing monitoring of drought indicators and the Public Works Department is primarily responsible for providing recommendations to City Council on drought stage declaration. The Drought Response Committee will meet at a minimum on an annual basis in February or March to review water supply and demand conditions and projections based on monitoring data. If water shortage conditions are anticipated the Drought Response Committee will determine the need for additional monitoring and determine the frequency of additional meetings. During drought declarations weekly or bi-weekly updates are recommended.

The Drought Response Committee Communications representative will lead public drought communication efforts and will rely upon the Drought Response Committee and Public Works staff for recommended content and updated drought response information.

The timing of a drought stage declaration is very important for Northglenn to effectively implement and engage the public in a staged response program. As the majority of demand



reducing measures rely on substantial changes to outdoor water use, drought stage declaration in late spring that provides ample time for communication with Northglenn water users and internal City departments will be far more effective than drought declarations made later in the year. Conversely, declaring a drought prematurely can result in unnecessary restrictions, impacting community confidence as well as City revenue.

7.2 Drought Public Information Campaign

Positive engagement from Northglenn's water users is vital for the successful implementation of any drought response. Many of the City's water customers will be reached by communications from neighboring municipalities. Northglenn staff will work to coordinate messaging when possible, particularly with the City of Westminster and City of Thornton who share geographic proximity and extensive reliance on Standley Lake for water storage, as well as Denver Water whose presence and drought outreach in the Denver-metro region are substantial. Direct communications from the City of Northglenn will also be required when any drought stage is anticipated or enacted.

Communications staff identified the following components of successful messaging campaigns that should be considered:

- Direct appeals to water users that show how they may benefit from water reductions may be more effective than appeals to a community-based mindset.
- Regardless of the venue, messaging should be consistent in order to avoid confusion and disengagement.
- Communicate what actions are expected of water users and give feedback on how the actions are leading to water savings.
- City of Northglenn actions to reduce water use should be promoted to show solidarity with water customers. Internal communications to City employees could be especially valuable. These actions can also have a significant impact on water savings as the City is a large water user.
- The City should communicate proactively about common perceptions of City "waste" of water on turf fields and high-visibility parks where infrastructure may prevent adherence to recommended watering schedules and restrictions.

A variety of internal and City-wide outlets are available for messaging about drought. These include the City Manager's Report, the Northglenn Connection, mailers and utility bill inserts, signage, social media, and the City's website. A direct mailer will be sent to all Northglenn water customers following the declaration or escalation of a drought stage. A standalone webpage containing information about drought status, which is separate from water conservation information on other webpages, will be a vital tool to provide updated information on drought status, recommended or required response actions, and general information regarding current water supply and drought conditions. Drought specific outreach materials should also be made available to customer service staff, Public Works staff, and Neighborhood Services (Code Enforcement) in order to provide accurate and consistent information to water customers who are concerned, in violation of water restrictions, or have questions about their water use. Additional financial and staffing resources may be necessary to support increased public outreach needs created by drought declarations.



7.3 Enforcement

Northglenn's Municipal Code Chapter 16 Article 23 provides the City Manager, with the support of relevant staff, the authority to enforce the drought response measures described in the Rules and Regulations governing drought declarations. While education and outreach are vital for communicating expectations and promoting efficient water use in all drought stages, warnings, citations, and fines may be issued to those out of compliance with drought rules and regulations. Fines will be applied to the responsible party's water bill and must be paid within the normal period allowed by the Utility Billing system.

Neighborhood Services (Code Enforcement) officers will be responsible for enforcing the Waste of Water Ordinance as well as any additional drought rules and regulations enacted by the City Manager. When drought restrictions are enacted or are imminent, Water Resources staff and the Drought Response Committee will communicate early with Neighborhood Services staff to prepare officers to effectively inform residents about the drought conditions and the need to conserve water.

Suspension or non-enforcement of landscaping ordinances that are in opposition to the goals of water conservation during drought may also be considered. Drought conditions may require a change in the expectations of lush landscaping throughout the City.

City staff and residents should be encouraged to participate in community enforcement of drought restrictions and waste of water by using the Access Northglenn online tool and mobile application⁴ including the submission of photographic evidence of non-compliance. Utilization of the Access Northglenn online tool can bolster enforcement capacity when Neighborhood Services resources are limited. Violations can also be reported via other channels, but evidence of the violations uploaded in the application is likely to increase compliance.

7.4 Water Quality and Treatment Considerations

Outdoor watering restrictions are a key tool Northglenn may need to use to reduce demand during times of drought and avoid more severe emergency water shortfall. Northglenn may consider enacting watering restriction schedules similar to neighboring municipalities in order to simplify messaging and compliance. However poorly considered restriction schedules for outdoor irrigation have the potential to negatively impact operations at the Water Treatment Facility by causing substantial variation in daily water demand. Address based restrictions where watering was allowed for even and odd addresses on separate days and watering was allowed on all properties during a single day during the 2002 drought led to days where demand ranged widely and negatively impacted operations. During drought, adjustments to watering schedule schemes and different watering schedules based on customer class should be considered in an effort to keep daily water demand as consistent as possible. Water Treatment staff recommend that coordination with large water users such as City parks could help ease the burden of address-based scheduling. A separate watering schedule for businesses and other customer classes should also be considered.

⁴ https://www.northglenn.org/government/access_northglenn.php



Drought could also impact the quality of water available at the Water Treatment Facility due to changes in the ecology and chemistry of Standley Lake. Water Treatment staff have operational plans in place to mitigate water quality issues, but future negative impacts to water quality due to drought should be considered.

7.5 City of Northglenn Conservation Actions

Northglenn can lead by example during drought. In addition to specific response measures listed under individual drought stages, City departments may be asked to make public pledges to reduce water use. Pledges to conservation can be especially effective in curtailing use and if publicly advertised, could also expand water conservation by establishing norms and expected behavior for other water customers. The DRC will request drought pledges from City departments and staff and responses will be provided to communications staff for further dissemination.

7.6 Revenue Implications and Financial Budgeting Plan

If water demand decreases under drought restrictions, revenues from water sales are also likely to be reduced, which could impact City revenue.

Northglenn's Municipal Code allows for implementation of drought surcharges for residential and commercial customers⁵. Drought surcharges can be used to offset some revenue losses when lower water volumes are sold in the system to residential and commercial customers.

Future reconsideration or restructuring of drought surcharges may allow for stronger incentives for water customers to use water efficiently during times of drought and avoid excessive use.

7.7 Monitoring of Plan Effectiveness

During periods of declared drought, Water Resources staff will monitor water use and storage in Standley Lake approximately weekly to evaluate the effectiveness of drought restrictions. Reduction in seasonal use (Stages 2 & 3) will be estimated by comparison to historical averages and reduction in indoor use will only be evaluated under Drought Emergency conditions. Water use data is updated weekly under current Water Resources operating procedures, but more frequent data can be requested from the Water Treatment Facility. Water storage in Standley Lake is updated at the monthly timescale, but rough estimates can be made more frequently if necessary.

7.8 Plan Approval

Northglenn's Drought Mitigation and Response Plan was adopted on **DATE** by the City Council.

7.9 Future Updates

Changes to both Northglenn's water supply and customer demand are expected in the future. Therefore, the Drought Mitigation and Response Plan will require updates at approximately five year intervals. Major changes to water system supply or demand will require additional Plan updates. This Plan may also be updated following years where drought restrictions are implemented in order to improve the implementation of the drought plan.

⁵ http://municode.northglenn.org/ch16/content_16-10.html