EPCOR WATER SERVICES

Edmonton Drought Resiliency Plan

2024

EPCOR

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Land Acknowledgement

As a company that operates across Turtle Island, also known as North America, EPCOR recognizes that its work takes place on the traditional territories of Indigenous Peoples. We respectfully acknowledge the significance of the lands and waters our utilities are situated on and by, including the diverse histories, languages, and cultures of the many First Nations, Métis, and Inuit Peoples, whose presence reaches back to time immemorial.

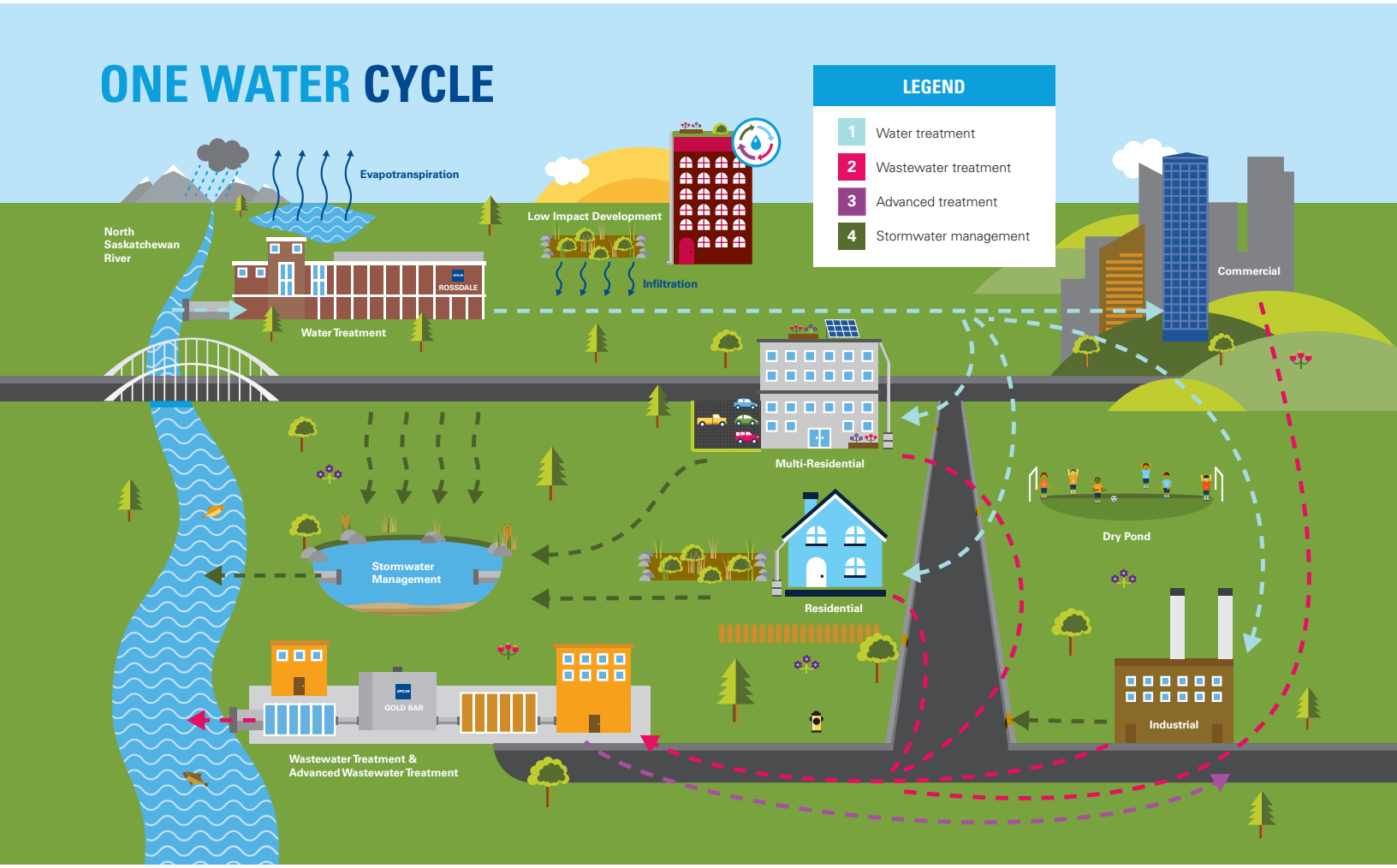
Several of our Canadian operations reside on territory that is covered under Treaties, which were entered into by First Nations peoples and the Crown. In particular, our headquarters in Edmonton, and both of the city's water treatment plants, are located on the banks of the North Saskatchewan River, found in the heart of Treaty 6 territory – the traditional lands of the Blackfoot, the Cree, the Dene, the Nakota Sioux, the Saulteaux, and later the Métis.

A ONE WATER CYCLE

EPCOR Water Services owns and operates the water and wastewater treatment utilities that make up Edmonton's water cycle.

Beginning in the heart of the Canadian Rockies, your water flows down the North Saskatchewan River (NSR) before reaching the Rossdale and E.L. Smith Water Treatment Plants. EPCOR's treatment facilities take up to 12 hours to clarify, disinfect and fully treat the water. During this process our water quality testing lab tests and adjusts for hundreds of parameters so we can provide you with high-quality drinking water for safety, colour, smell and taste.

Your water then travels through thousands of kilometres of underground pipe to make sure it's always there when you turn on your tap, take a shower or flush your toilet. The drainage system then captures and takes away wastewater for processing at Gold Bar Wastewater Treatment Plant. In addition, over 200 stormwater management facilities across Edmonton capture and filter rainwater for delivery to the NSR and other waterways thereby protecting the environment.



SUSTAINABILITY THROUGH RESILIENCY

EPCOR is committed to delivering safe, clean drinking water to more than 1 million residents in Edmonton and surrounding communities, even as we mitigate challenges such as climate change and evolving consumption patterns.

EPCOR has several initiatives in place to protect our source water (the NSR) and our treatment and distribution processes and systems. These initiatives are summarized in our various planning documents, which include:

- Integrated Resource Plans (Water, Stormwater, Wastewater)
- Source Water Protection Plan
- 2023 EPCOR Sustainability Report

This Drought Resiliency Plan details actions to prepare and manage through drought conditions, and to help achieve the following four objectives:

1.

PREDICT THROUGH MONITORING, MODELLING AND FORECASTING

To predict, plan, manage and respond to drought risk in the Edmonton region in both the short and long term.

2.

MANAGE WATER DEMAND

Improving resilience to drought in the short term through collaborative planning, preparation, and response that focuses on reducing water demand during peak water use periods and in the long term through continued conservation efforts.

3.

BUILD RESILIENCE

Building resilience to drought long-term through innovative conservation, stormwater management, green infrastructure, and water reuse and watershed protection solutions.

4.

AWARENESS AND COMMUNICATION

Communicating to EPCOR's customers and partners about the impacts of drought in the Edmonton region.

DROUGHT IN EDMONTON AND SURROUNDING AREA

To fully understand the type of drought Edmonton and area could face, we must first consider our water source – the North Saskatchewan River.

The NSR experiences variations in flow rate over the seasons and years; however, even when the NSR experiences hydrological drought (see pg. 8) and low flows, it is anticipated there will still be ample supply of water in the NSR to provide potable water for Edmonton and the surrounding areas.

At times, EPCOR water treatment plants' ability to meet customer demands for water are challenged. This risk of water demand being higher than what the water treatment plants can supply is more likely than inadequate raw water supply in the NSR.

Our Drought Resiliency Plan is important because although drought is a lower climate risk for the Edmonton region:

1. there is uncertainty around how climate change may affect long-term water availability in the NSR and demand in the Edmonton region and,
2. soil moisture drought (see pg. 8) is predicted to become more frequent in Edmonton due to rising temperatures, lower soil moisture conditions and longer heat waves.

EPCOR has a responsibility to anticipate and moderate the negative impacts of drought to our customers. We do this by better understanding drought impacts and vulnerabilities, and developing strategies to manage them over the short and long term through our Drought Resiliency Plan.

Being drought-resilient means that people and the ecosystems in which we operate are prepared to withstand and recover from the impacts of prolonged periods of dry conditions and water shortages.

COLLABORATIVE PLANNING

EPCOR is committed to working proactively and collaboratively with all partners involved in drought management and response.

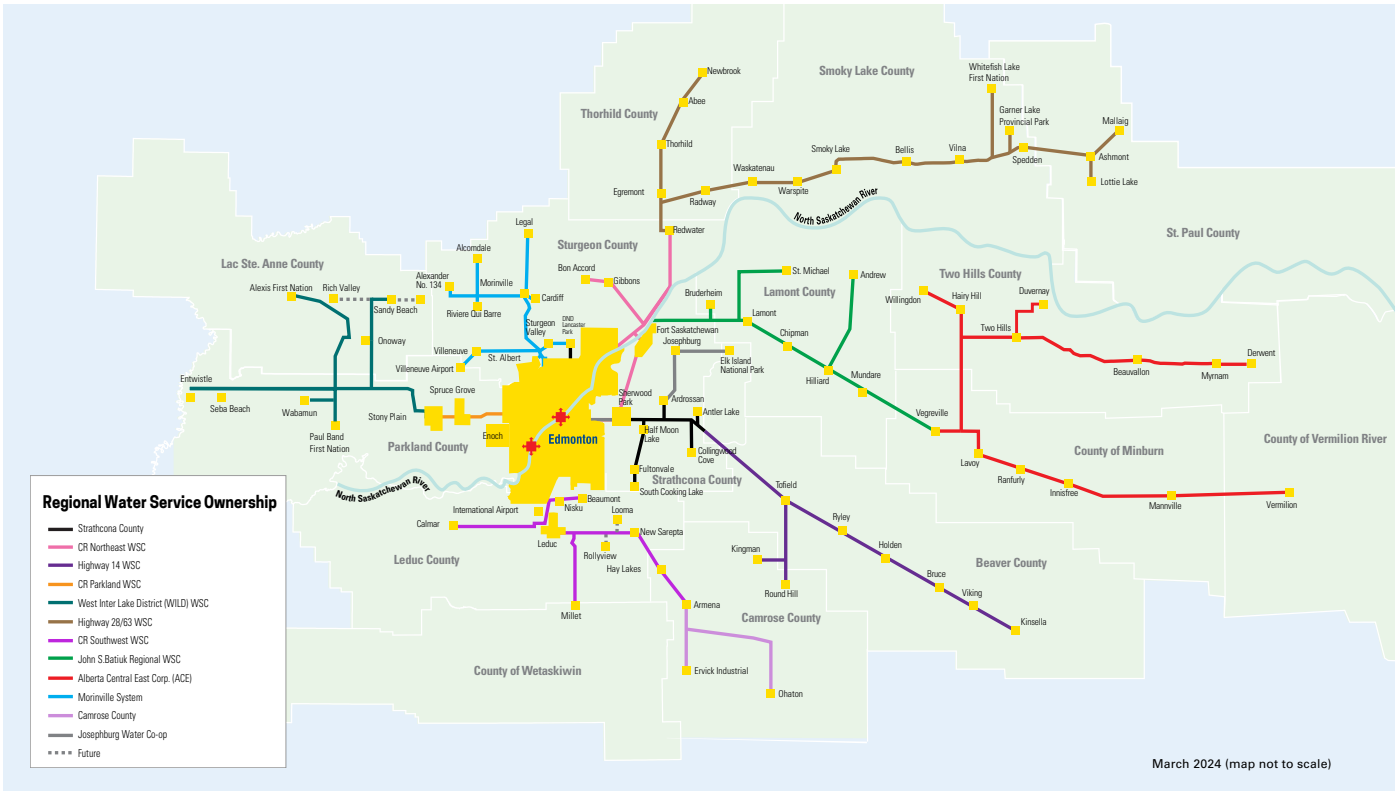
The creation and implementation of the Drought Resiliency Plan relies on the support of City of Edmonton and its citizens, EPCOR's regional customer groups and partners across the larger NSR watershed.

EPCOR's Partners Include:

- Alberta Water Council
- North Saskatchewan Watershed Alliance
- Government of Alberta
- Edmonton Metropolitan Region Board and Member Municipalities
- Industry associations
- Academic partners

The Drought Resiliency Plan draws links to other provincial, regional, City of Edmonton, and EPCOR priorities and initiatives, contributing to broader objectives and directing further action. There has been a lot of work completed to date, and the Drought Resiliency Plan leverages that work, but with a focus on drought management.

EPCOR Water Treatment Service Area



DEFINING DROUGHT

Drought is complex and can be difficult to measure and define. In general, drought refers to a prolonged period of dry conditions that cause shortages in the availability of water for humans and ecosystems.

There are four commonly used drought classifications, based on their area of impact, they are: meteorological, soil moisture, hydrological and socio-economic drought. These drought types may occur independently or simultaneously but are all driven by the onset of a metrological drought.

1.

METEOROLOGICAL DROUGHT

Usually the first type of drought to occur, meteorological drought is a result of less precipitation than normal over a prolonged period in a specific region. This type of drought will typically increase water demand from customers and potentially add strain to the water supply system.

2.

SOIL MOISTURE DROUGHT

Soil moisture drought occurs when there is not enough soil moisture to meet the needs of crops, pastures or other vegetation during the growing season. It usually occurs next after a meteorological drought and can be narrowed down to a local geographic area (i.e. Edmonton area).

3.

HYDROLOGICAL DROUGHT (LOW RIVER CONDITIONS)

Hydrological drought occurs when surface water or groundwater levels fall to below-average levels because of a lack of precipitation.

4.

SOCIO-ECONOMIC DROUGHT

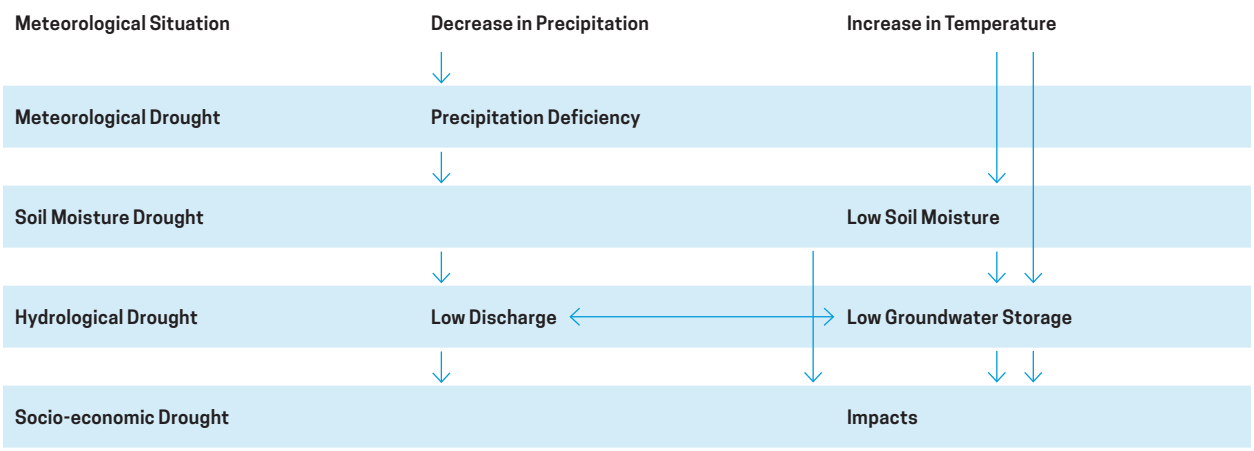
Socio-economic drought occurs when the prolonged water shortage in a region begins to impact people and the economy.

Source: alberta.ca/drought-101

A multi-year drought is among Edmonton's climate hazards and the risk changes as population grows and climate changes. Increased summer temperatures and decreased summer precipitation indicate that meteorological drought conditions may become more common, prolonged and widespread.

The drought impacting the Edmonton area in the near and the long-term is meteorological drought that leads to soil moisture drought. The risk of a hydrological drought that affects the NSR water supply is low. Creeks within Edmonton are in moderate risk of hydrological drought.

Evolution of a Typical Drought and Edmonton Region Risk



Drought begins with a meteorological situation of lower precipitation or higher temperatures. These conditions lead to a soil moisture drought, which can be localized or widespread. If it is widespread in a watershed it can then lead to a hydrological drought, evidenced by lower than average flow conditions.

IMPACTS OF DROUGHT

The impacts and consequences of drought in Edmonton and in the NSR watershed can cascade through the one water cycle. The most obvious and significant impact is peak demand exceeding potable water supply due to increased outdoor irrigation. Others are more nuanced but still leave profound and lasting effects, such as the transition of a parkland ecosystem to a grassland ecosystem. Drought can also increase the risk of other hazards, including vegetation stress and wildfires.

Water Supply and Utility Impacts

Soil moisture drought can lead to issues meeting customer demand for water, and this can have cascading effects throughout the city and region.

- A decrease in soil moisture content may lead to an increased number of water main breaks due to soil conditions/shrinkage
- A decrease in water levels in stormwater management facilities may lead to aesthetic issues and algae growth
- Dry vegetation can lead to higher risk of wildfire which could impact our infrastructure and prolonged heat may affect the microbiology at the wastewater treatment plants, effecting treatment capability

Ecological Impacts

Soil moisture drought reduces the water available to allow natural spaces and ecosystems to thrive. This can lead to loss of habitat and biodiversity, or reduced water quality in urban streams and the NSR.

Economic Impacts

Soil moisture drought reduces the water available for irrigation, industry, and recreation. These issues are compounded by the unpredictability and instability of multi-year drought conditions.

Social Impacts

Depending on its scale, soil moisture drought can have a direct impact on people's physical and mental health. This might include a reduction/modification of recreation opportunities from heat stress.

CURRENT RISKS

RISK 1 Low North Saskatchewan River supply

RISK 2 Licence restrictions and priority for withdrawals

RISK 3 Meteorological and Soil Moisture Drought Increases Potable Water Demand

RISK 1

Low North Saskatchewan River Supply

LOW RISK: Risk of a hydrological drought in the NSR is low due to high river water supply; predicted increase in precipitation; and storage availability in upstream reservoirs.

Over the past 50 years, the NSR has had a healthy average annual flow and most of the water in the NSR originates in the headwater areas of the Rocky Mountains. Two dams, Bighorn and Brazeau, upstream of Edmonton regulate flow of the NSR and provide a significant amount of storage of snowpack melt and precipitation from the headwaters.

See EPCOR's *Source Water Protection Plan* on epcor.com for a review of the risk of hydrological drought impacting the raw water supply.

Future climate predictions indicate more precipitation is expected in the NSR basin overall and an average increase in NSR annual flow of 8 per cent.

The operation of the two upstream hydroelectric dams has a profound effect on the timing of flows in the NSR, reducing peak flows in the spring and summer and increasing flows in the fall and winter.

By storing large volumes of water, the Bighorn and Brazeau dams help reduce the risk of low flows and droughts. However, water stored at the dams may not be available to enhance flows if there is a dramatically reduced snowpack and/or drought in consecutive years. Flows in the NRS could therefore be affected by climate change, and also by changes in how the upstream dams operate based on the timing and magnitude of flows into their reservoirs.

It is important that research and monitoring continue and that mitigation plans are in place over the long term in case this risk changes.

RISK 2

License Restrictions and Priority for Withdrawals

LOW RISK: EPCOR has priority in licenses in the NSR and holds two water licenses for the purpose of urban water supply from the NSR. As of the fall of 2024, there are no restrictions to the NSR licenses.

Currently, the volume of water in the NSR is high compared to the amount of water withdrawn by our water treatment plants for drinking water purposes. The average daily per cent withdrawal for the Rossdale and E.L. Smith Water Treatment Plants is less than 3 per cent of the total daily flow on average over the year.

RISK 3

Meteorological and Soil Moisture Drought Increases Potable Water Demand

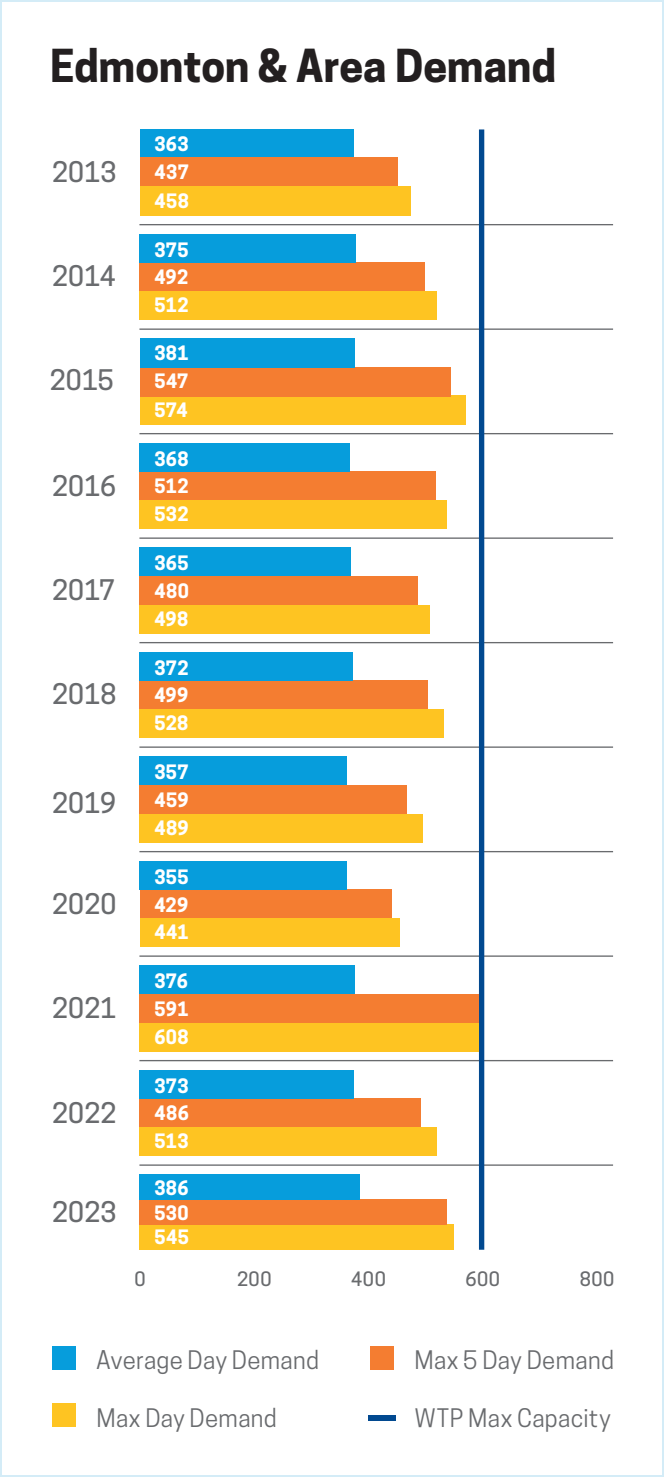
MODERATE RISK: Increased frequency of soil moisture drought in Edmonton will increase peak demand, which will put a strain on water treatment plant infrastructure.

In Edmonton, the average annual temperatures have already risen by more than 2°C. Summers are not getting hotter on average, but winters are much less cold, with temperatures rising 6.5°C during those months. Future climate predictions are for increased temperature in Edmonton. An additional overall increase of approximately 4°C is expected by 2080.

With an expected 4°C increase in temperature, the ecosystem in the Edmonton area will shift to more drought tolerant grassland species and put stress on local ecosystems as they struggle to adapt.

Seasonal water usage (May-September consumption) in Edmonton is linked to the summer weather conditions. During longer hot, dry summers, seasonal demand for water increases due to more outdoor watering.

Demand management can be used to reduce demand in scenarios when demand exceeds maximum production capacity as shown in the graph on the right.



EPCOR Water Treatment Plants Water Demand and Maximum Treatment Capacity (2013 – 2023)

Water demand management measures are sufficient to bridge short-term hot and dry conditions. However, a shift to a more holistic approach is needed for long-term sustainability. Additional risks that need to be considered include short and long-term effects on local vegetation if more frequent demand management measures are utilized.

TYPE OF DROUGHT	RISK IN EDMONTON
METEOROLOGICAL DROUGHT	Moderate
SOIL MOISTURE DROUGHT	Moderate
HYDROLOGICAL DROUGHT	Low for North Saskatchewan River
	Moderate for Creeks
SOCIO-ECONOMIC DROUGHT	Low

DROUGHT RESILIENCE FRAMEWORK

OBJECTIVE 1 Predict through monitoring, modelling and forecasting

OBJECTIVE 2 Manage water demand

OBJECTIVE 3 Build resilience

OBJECTIVE 4 Awareness and communication

OBJECTIVE 1

Predict Through Monitoring, Modelling and Forecasting

Monitoring and forecasting are the first step of drought resiliency planning and are done in the short and long term to assess the risk of multiple types of droughts. **It is critical to understand the likelihood of climate scenarios and drought frequency to respond efficiently and appropriately.**

Action 1

SHORT-TERM: MONITORING AND FORECASTING

Our Water Treatment Plant Operations performs daily monitoring and forecasting, including a one-week forecast each day. This forecasting can feed into short-term demand management measures, which are discussed further below.

Potable water production can be increased when short-term drought (approximately 2 weeks) is predicted to hold a higher volume of water in the distributed field reservoirs. At the same time, demand management measures can be invoked to reduce overall load and conserve water.

EPCOR's Watershed team monitors drought conditions weekly and includes the past year, current, and forecasted conditions of the NSR for water supply and local drought.

Action 2

LONG-TERM: RIVER SUPPLY – 30-50 YEAR CLIMATE CHANGE PREDICTIONS

EPCOR's *Source Water Protection* plan covers our research in drought prediction over the long term.

Our research includes funding climate modelling for the NSR basin to predict local and regional changes in precipitation, temperature and river flow. It also informs drought resilience scenarios over the longer term and supports the development of on-site storage of rainwater.

The NSR Water Management Roadmap Project is underway, looking at future climate change scenarios on water supply in the NSR over the long term.

OBJECTIVE 2

Manage Water Demand

The water treatment plants' ability to supply enough water to customers during hot, dry summer conditions is a key risk. Demand management can help address this risk in the short term, while conservation efforts across Edmonton and surrounding areas help to reduce demand over the long term.

CONTINUE AND IMPROVE CURRENT CONSERVATION EFFORTS

EPCOR has a rich history of implementing a variety of industry best management practices, which have resulted in significant water efficiency improvements. Edmonton's per capita water use is now lower compared to the Canadian average and discretionary outdoor water use has dropped substantially over the past two decades.

In 2023, Edmonton total per capita consumption was down to 249 litres per person per day, with residential per capita consumption dropping below 160 liters per person per day. Consumption rates in new developments across Edmonton are below 150 litres per capita per day, highlighting that the decreasing trend in water consumption is likely to continue.

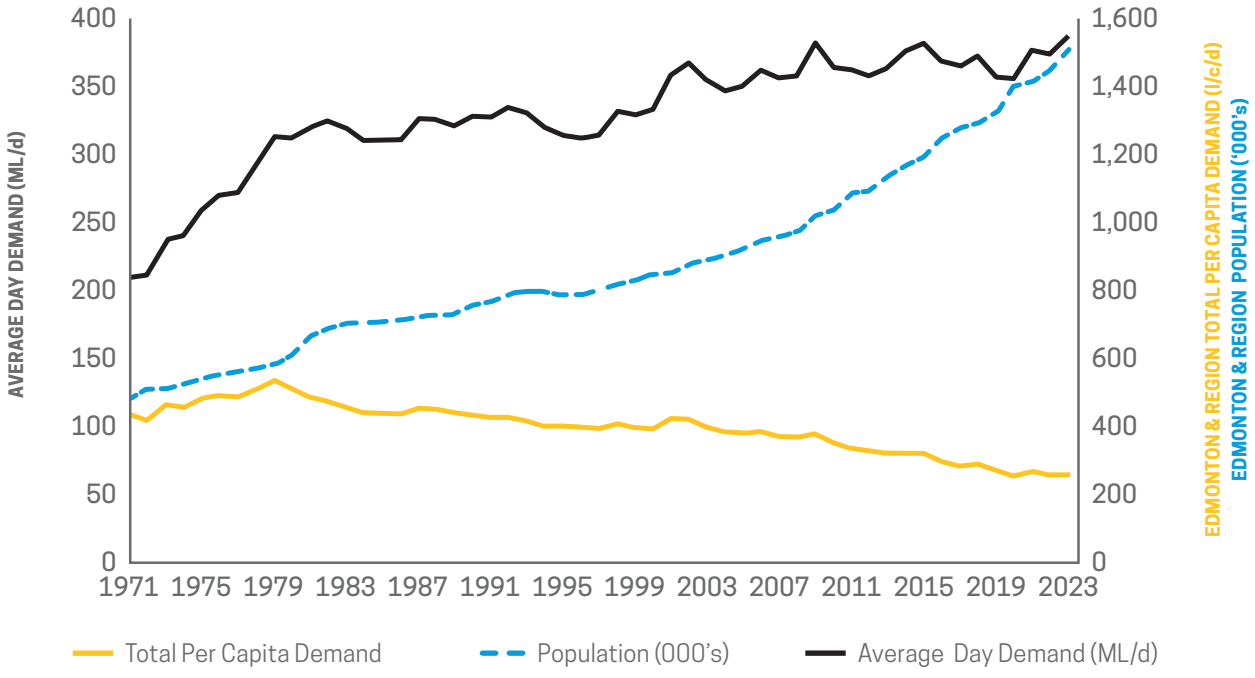
EPCOR continues to make advancements in water efficiency, improving infrastructure resiliency and affordability. EPCOR's Advanced Metering Infrastructure (AMI) Project will also help detect leaks or continuous flows, benefiting customers.

EPCOR is exploring initiatives that will reduce peak flows, further optimizing system capacity. This includes capturing rainwater for gardening, balancing outdoor watering scheduling and encouraging landscaping design standards that call for native and drought-tolerant species.

City of Edmonton Historical Water Usage

The following graph shows that water demand has remained relatively flat (black line) even as Edmonton's population increased (blue line).

Edmonton Region Water Usage



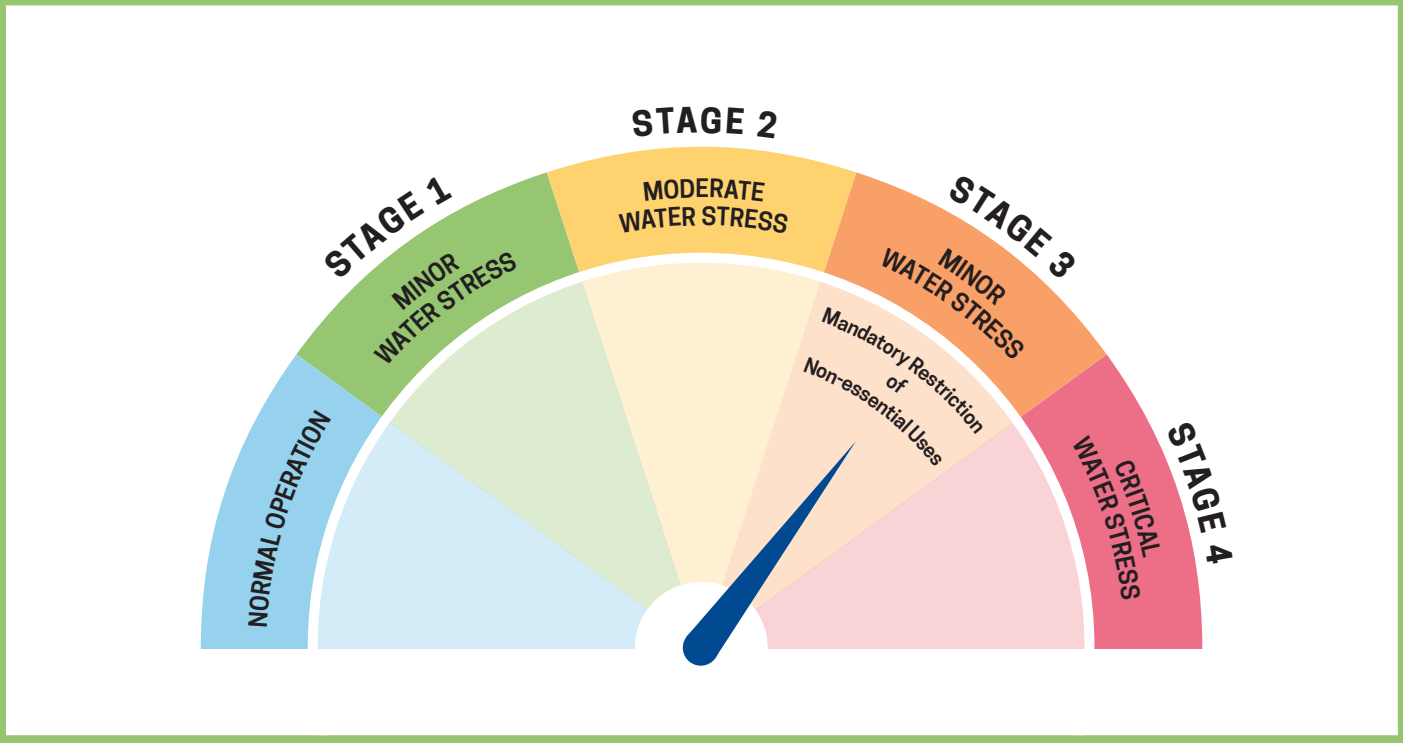
Action 4

REASSESS DEMAND MANAGEMENT MEASURES

Water demand management measures can be useful when forecasted demand exceeds the amount of water the utility can produce or deliver to its customers. These are valuable during drought conditions.

EPCOR is updating its water demand management measures, rendering them more flexible based on aspects such as plant capacity and customer usage during different seasons. The updated framework includes fixed demand reduction targets at each stage, including a state of normal operation where best practices in water conservation and management are in place.

To reach the fixed reduction targets for each stage, actions undertaken are responsive to customer behaviours and seasonal needs. Summertime restrictions, appeals and messaging have a stronger focus on targeting outdoor water use while actions in the winter place a larger emphasis on indoor water use among residential and commercial customers.



OBJECTIVE 3

Build Resilience

Drought resilience can be improved through a combination of conservation and demand management measures (Objective 2), and through innovative stormwater management and water reuse solutions, as well as green space and watershed protection.

Stormwater management in Edmonton is collaborative because EPCOR owns the piped infrastructure, sets land use standards around runoff and works with the City of Edmonton and landowners and the development community on implementation of the standards. Actions below require an aligned and collaborative effort across the City of Edmonton and among regional partners.

Action 5

MANAGE POTABLE WATER DEMAND THROUGH STORMWATER USE AND REUSE

- **Rainwater capture:** Homeowners can capture rainwater from roof tops and store it for later use in dry conditions. This is a good alternative for the use of potable water and provides some degree of stormwater control.
- **Stormwater use:** The Government of Alberta regulates the use of water with the *Water Act*. It was amended in 2023 to exempt stormwater diversions of up to 6,250 m3 from a stormwater pond under a list of conditions. Alberta Health regulates this activity under the Public Health Guidelines for Water Reuse and Stormwater Use (Alberta Health 2021). This remains an opportunity for non-potable water use in drought conditions and is a good strategy for long-term drought resiliency.
- **Low impact development:** Low impact developments (LIDs) capture and store rainfall and help to slow stormwater from entering the stormwater system. LIDs help to reduce the demand for irrigation on the potable water system. In addition, many LIDs use native species accustomed to weather fluctuations in the Edmonton region and tend to be drought tolerant.
- **Treated wastewater reuse:** EPCOR owns, operates and maintains the Gold Bar Wastewater Treatment Plant. Approximately 10 million litres per day (MLD) of membrane treated wastewater effluent is sent to nearby industries and used in their system. Increasing treated wastewater reuse will reduce demand on the potable water system. Treated wastewater can be reused for irrigation, or industrial processes.
- **Promoting preservation and enhancement of existing greenspaces and building of green infrastructure:** This can reduce heat island effects and must be done in collaboration with the City of Edmonton.

Action 6

ASSESS CAPACITY OF EXISTING SYSTEM TO MEET FUTURE NEEDS

EPCOR will continue to assess water treatment plant capacities and future reservoir storage needs to meet growing customer demands and to meet the need for additional storage during extended heat waves and high demand periods.

Action 7

WATERSHED MANAGEMENT, COLLABORATION AND POLICY

EPCOR will continue to work with its many partners to improve water management in the North Saskatchewan River watershed. This includes Water for Life partners: Alberta Water Council (AWC) and North Saskatchewan Watershed Alliance, of which Alberta Environment and Protected Areas (AEPA) and the City of Edmonton are key members.

In addition, EPCOR is part of the Industrial Heartland and Capital Regional Water Management Framework working group. Recognizing the value of partnerships, EPCOR continues to work closely with AEPA, the City of Edmonton and others to advance projects related to drought, climate change and watershed protection.

OBJECTIVE 4

Awareness and Communication

EPCOR currently uses several channels to deliver information on water efficiency and conservation.

By using metered water consumption data, EPCOR has a well-rounded understanding of water use in Edmonton. While many customers are efficient users, targeted communications are used to ensure high use customer segments are reached. EPCOR will continue to publish helpful information on its website, social media channels, in reports, and through partner engagement activities.

Action 8

DROUGHT OUTREACH PLAN

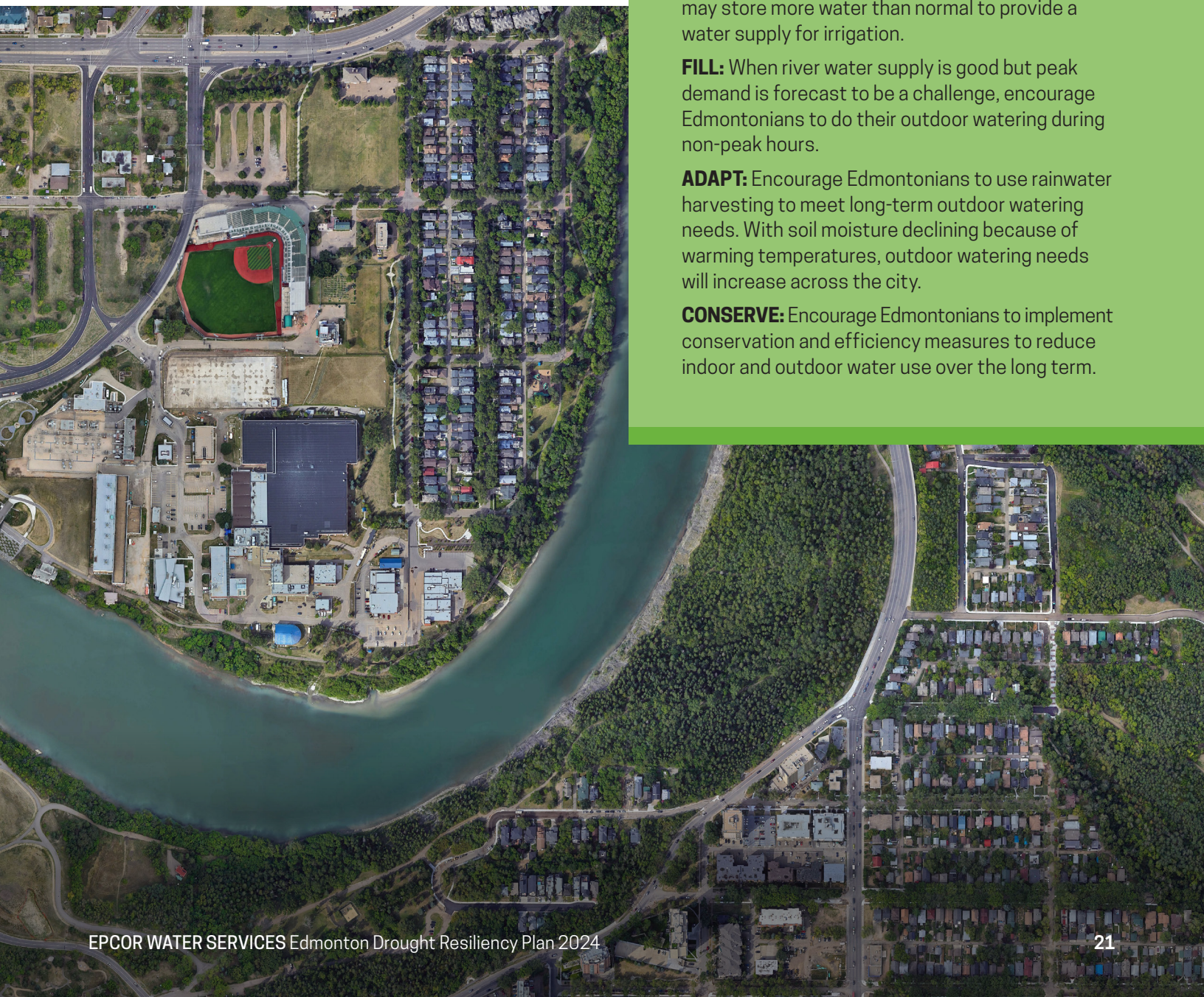
There is progress to be made for communication around drought management that aligns with the current drought conditions. The opportunity exists to align communications with current drought conditions. We'll continue to work with our partners to share information about the associated risks and what actions people can take to use water wisely.

STORE: When river water supply is expected to be lower than average, stormwater storage will be encouraged. Stormwater management facilities may store more water than normal to provide a water supply for irrigation.

FILL: When river water supply is good but peak demand is forecast to be a challenge, encourage Edmontonians to do their outdoor watering during non-peak hours.

ADAPT: Encourage Edmontonians to use rainwater harvesting to meet long-term outdoor watering needs. With soil moisture declining because of warming temperatures, outdoor watering needs will increase across the city.

CONSERVE: Encourage Edmontonians to implement conservation and efficiency measures to reduce indoor and outdoor water use over the long term.



MOVING FORWARD

The table below outlines the actions that will be taken in the coming years to build drought resilience within the City of Edmonton and with our regional partners.

	STATUS (as of December 2024)	**OBJECTIVE 1:** Predict through monitoring, modelling and forecasting	**OBJECTIVE 2:** Manage water demand	**OBJECTIVE 3:** Build resilience	**OBJECTIVE 4:** Awareness and communication
SHORT TERM (2024-2025)					
Review and update Demand Management Measures to include a drought scenario	**In progress**		✕		
Develop outdoor water use restriction measures in consultation with regional customers, the City of Edmonton and other customer groups	**In progress**		✕		✕
Share updated demand management measures with customers and key partners	**Planned**		✕		✕
Develop and execute on a drought resiliency communication plan	**Planned**				✕
Use the RainWise Rebate Program to promote resiliency	**In progress**			✕	✕
MID-TERM (2025-2028)					
Investigate stormwater reuse options	**Planned**			✕	
Reassess conservation and efficiency planning for benefits across the one water cycle	**In progress**		✕		
Review wastewater treatment biology tolerance during extended heat wave	**Planned**			✕	
LONGER TERM (2029+)					
Continue to refine both short and long-term forecasting as Advanced Metering Infrastructure is established	**In progress**	✕	✕		
Assess water treatment plant capacities and future reservoir storage to meet growing customer demands	**In progress**		✕	✕	
Conduct an evaluation of additional wastewater reuse options at Gold Bar Wastewater Treatment Plant and in collaboration with ARROW utilities	**Planned**		✕	✕	

EPCOR is committed to building drought-resilience across the one water cycle to help mitigate the impacts of drought and climate change. This Drought Resiliency Plan identifies specific goals and actions centering on drought prediction, reducing water demand, building resiliency through innovative solutions across the one water cycle and communicating proactively.

EPCOR