



AN UPDATE ON WATER ALLOCATION AND USE IN THE NORTH SASKATCHEWAN RIVER BASIN IN ALBERTA

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PRESENTATION OUTLINE

1. Introduction
2. The 2007 Water Use Study
3. 2016: What has Changed?
- 4: Summary and Future Challenges

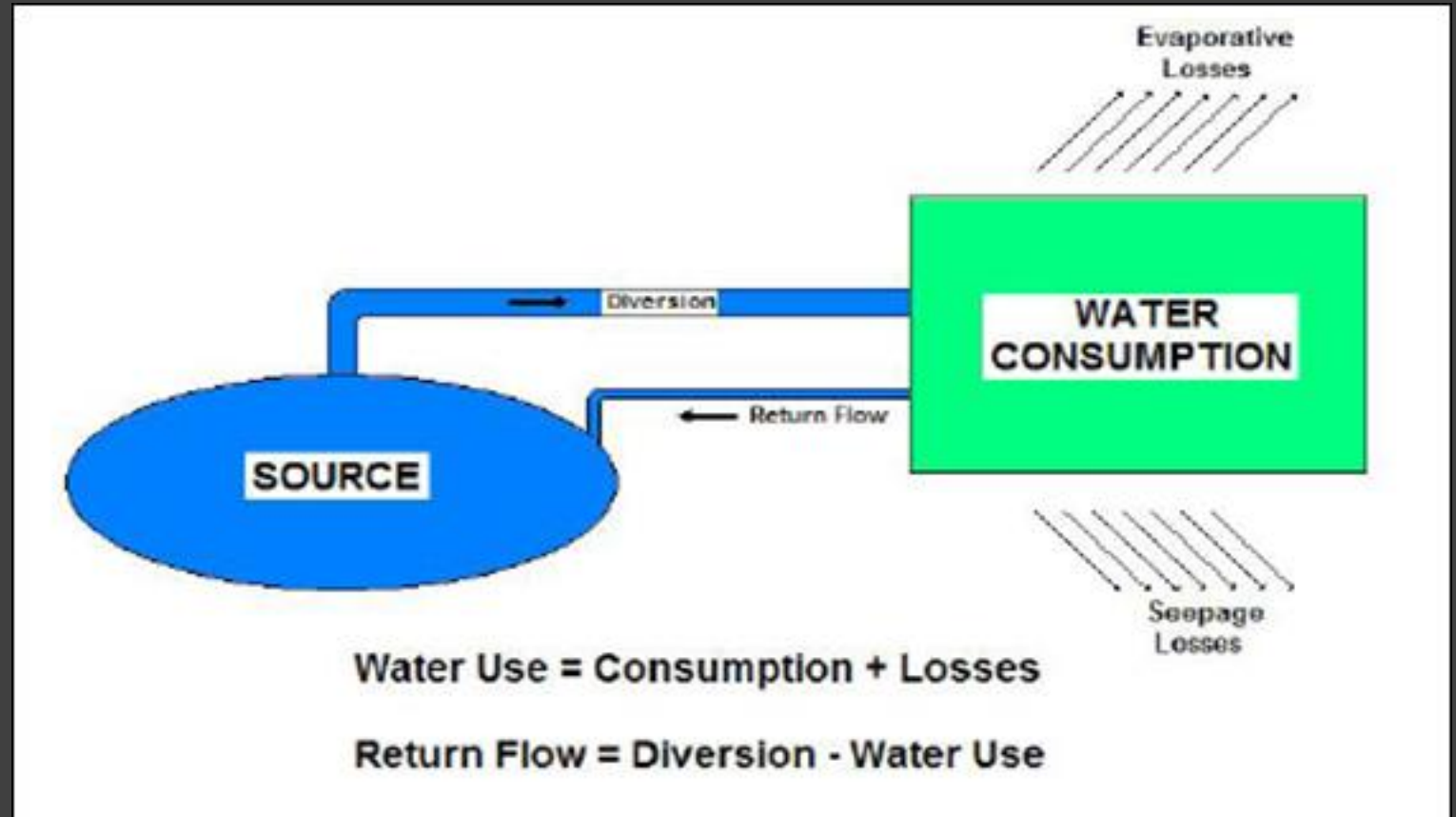
1. INTRODUCTION

Important to understand water use in the basin

- Needed to ensure we are meeting terms of Apportionment Agreement (PPWB)
 - Apportionment Agreement requires that Alberta pass on 50% of flow of the North Saskatchewan River to Saskatchewan
- Useful for estimating natural flows
 - Natural flow equals recorded flow plus upstream water use
- Valuable for determining when maximum allocations are reached
 - Balance water supply and demand
 - Especially important in the sub-basins

1. INTRODUCTION

- Important concepts
 - **Licensed allocation**
 - Amount of water that can be diverted for use
 - **Licensed Consumption**
 - Amount of water that is expected to be lost due to use or losses
 - **Licensed Return flow**
 - Amount of water that is returned to a water body after use
 - **Actual Consumption**
 - Actual withdrawals minus return flows



1. INTRODUCTION

Water Uses	Specific Water Uses
Municipal	Urban, Subdivisions, Cooperatives, Institutions, Schools, Other
Stockwatering	Feedlots, Stockwatering, Registrations
Crops	Irrigation
Commercial	Gardens, Golf courses, Parks, Recreation, Aggregate washing, Construction, Bottling
Petroleum	Oilfield injections, Gas/petrochemical plants, Oil/gas well drilling
Industrial	Hydro power, Cooling
Other	Drainage, Remediation, Flood control, Stabilization, Fish/fish farms, Storage reservoirs for wildlife, Wetlands, Other

1. INTRODUCTION

Water allocations and use is measured in terms of:

- **Cubic decametre (dam^3)**
 - $1 \text{ dam}^3 = 1,000$ cubic metres
 - $1 \text{ dam}^3 = 1,000,000$ litres
 - $1 \text{ dam}^3 = 0.81$ acre-feet
 - 1 acre foot = 1233.5 cubic metres
- Original licence allocations were done in acre-feet, which was the amount of water required to cover 1 acres of land with 1 foot of water (271,328 imperial gallons or about half the volume of an Olympic size swimming pool)

1. INTRODUCTION

- **12 Sub-basins**

- **Headwaters**

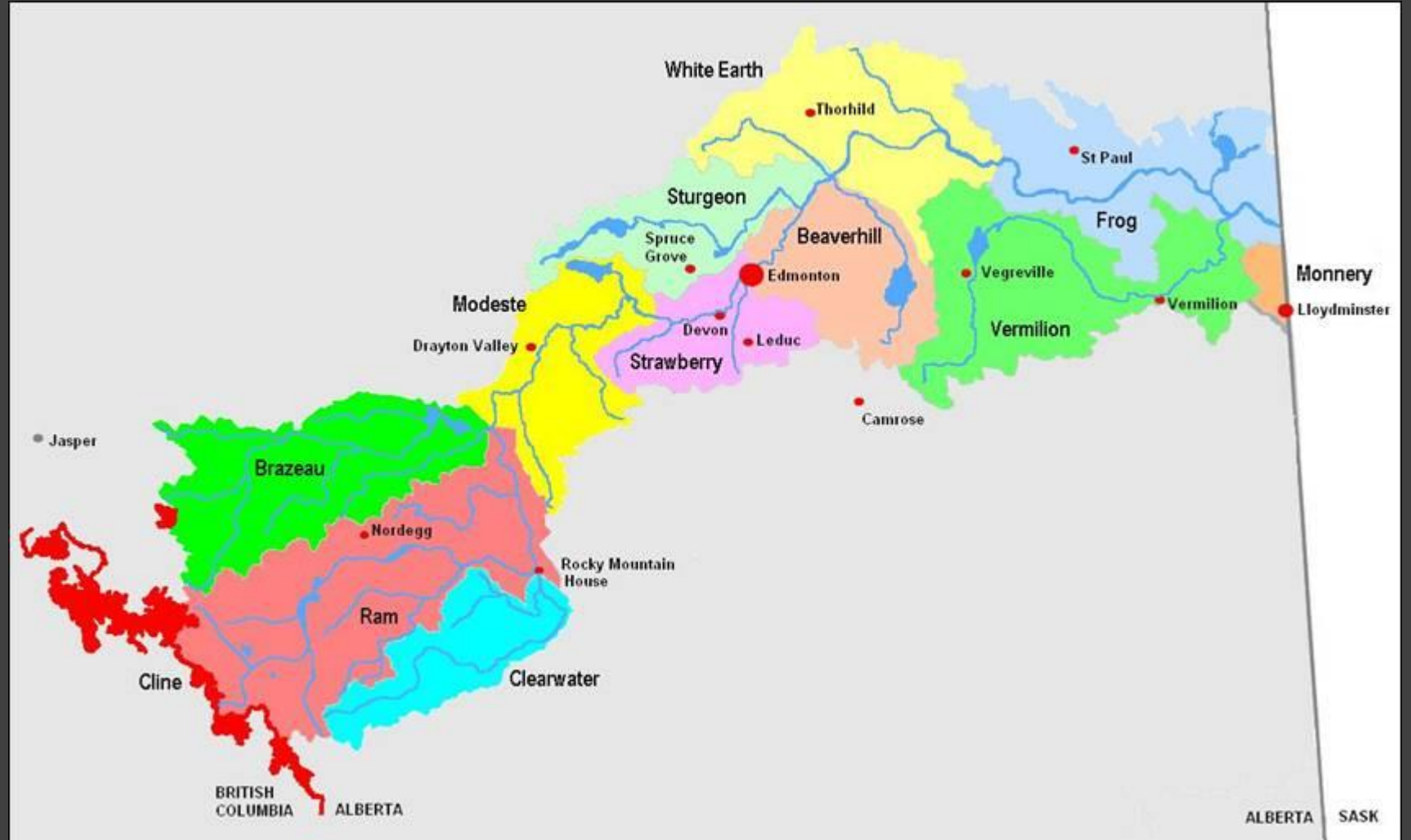
- Cline
 - Brazeau
 - Ram
 - Clearwater
 - Modeste

- **Capital Region**

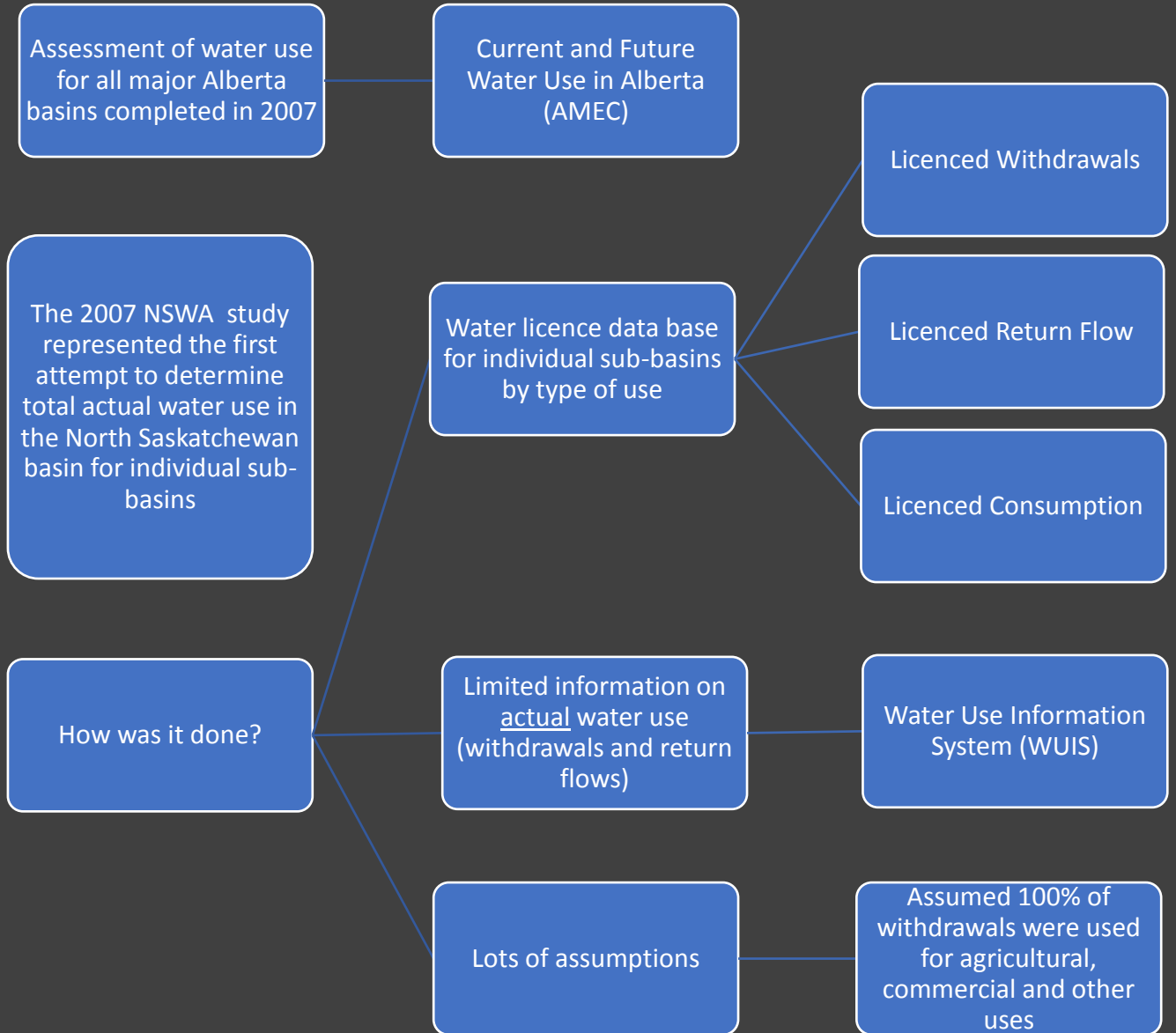
- Strawberry
 - Sturgeon
 - Beaverhill

- **Downstream**

- White Earth
 - Vermilion
 - Frog
 - Monnery

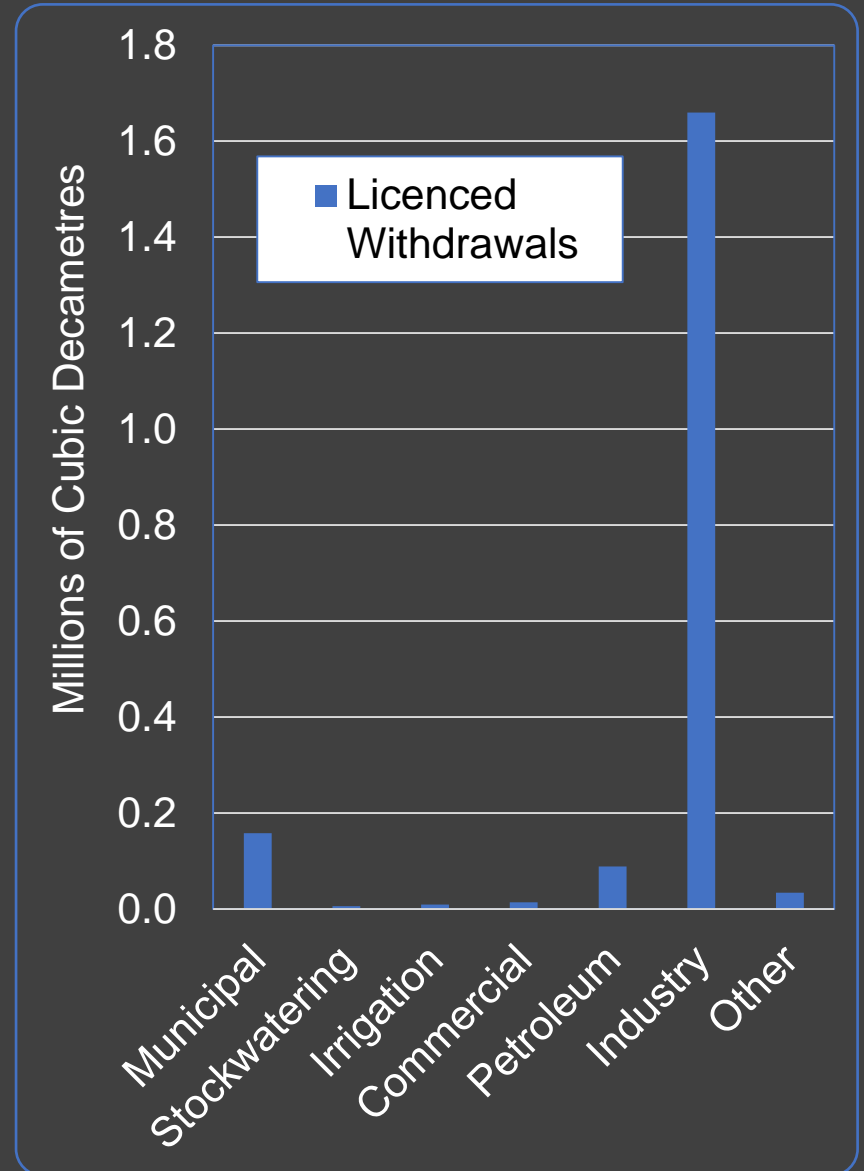


2. THE 2007 WATER USE STUDY



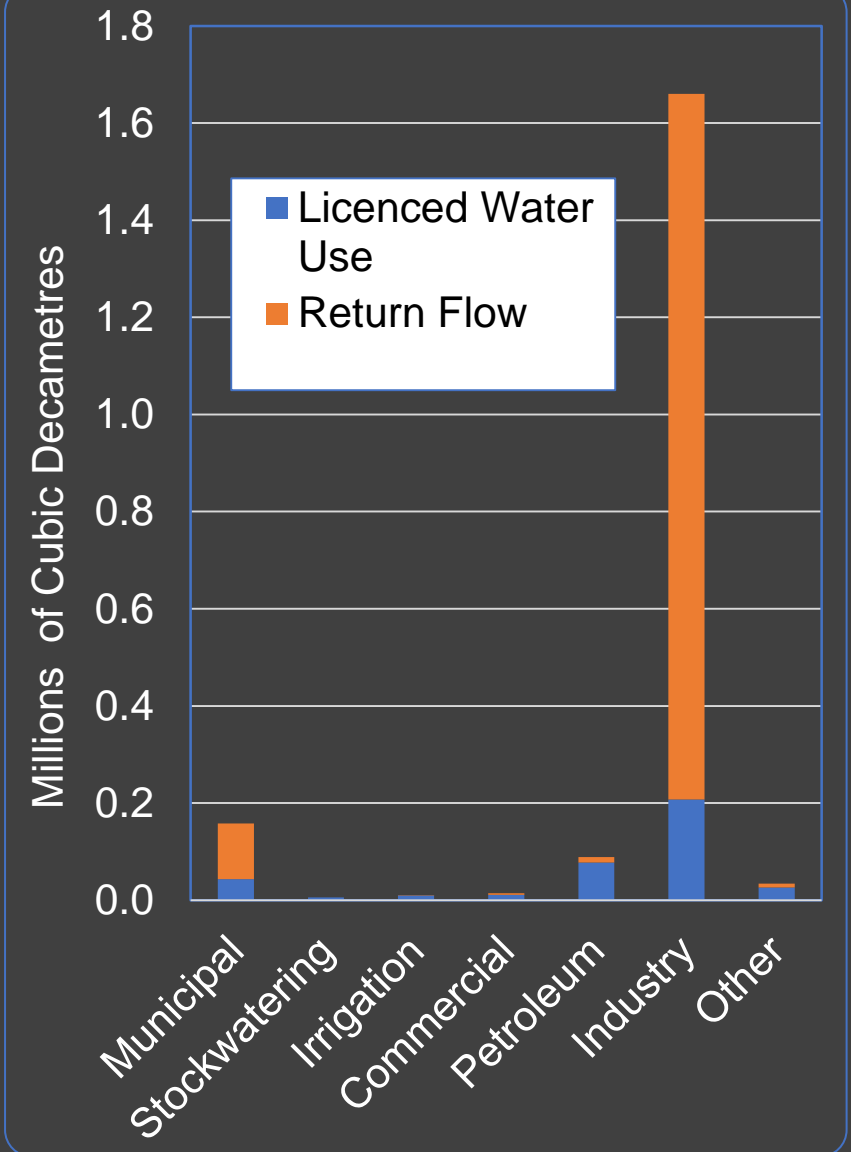
2007 Water Allocations

- **Licences allocated 1.996 million cubic decametres (dam³) of water to be withdrawn for various purposes**
 - 98.7% of this was for surface water (1.97 million dam³)
 - Licenced withdrawals represent 27% of the mean annual flow of the North Saskatchewan River (7.3 million dam³)
- **Industrial sector (cooling) accounted for 83% of allocations**
 - Municipal 8%
 - Petroleum sector 5%
 - Other uses (agriculture , commercial, other) accounted for 4%



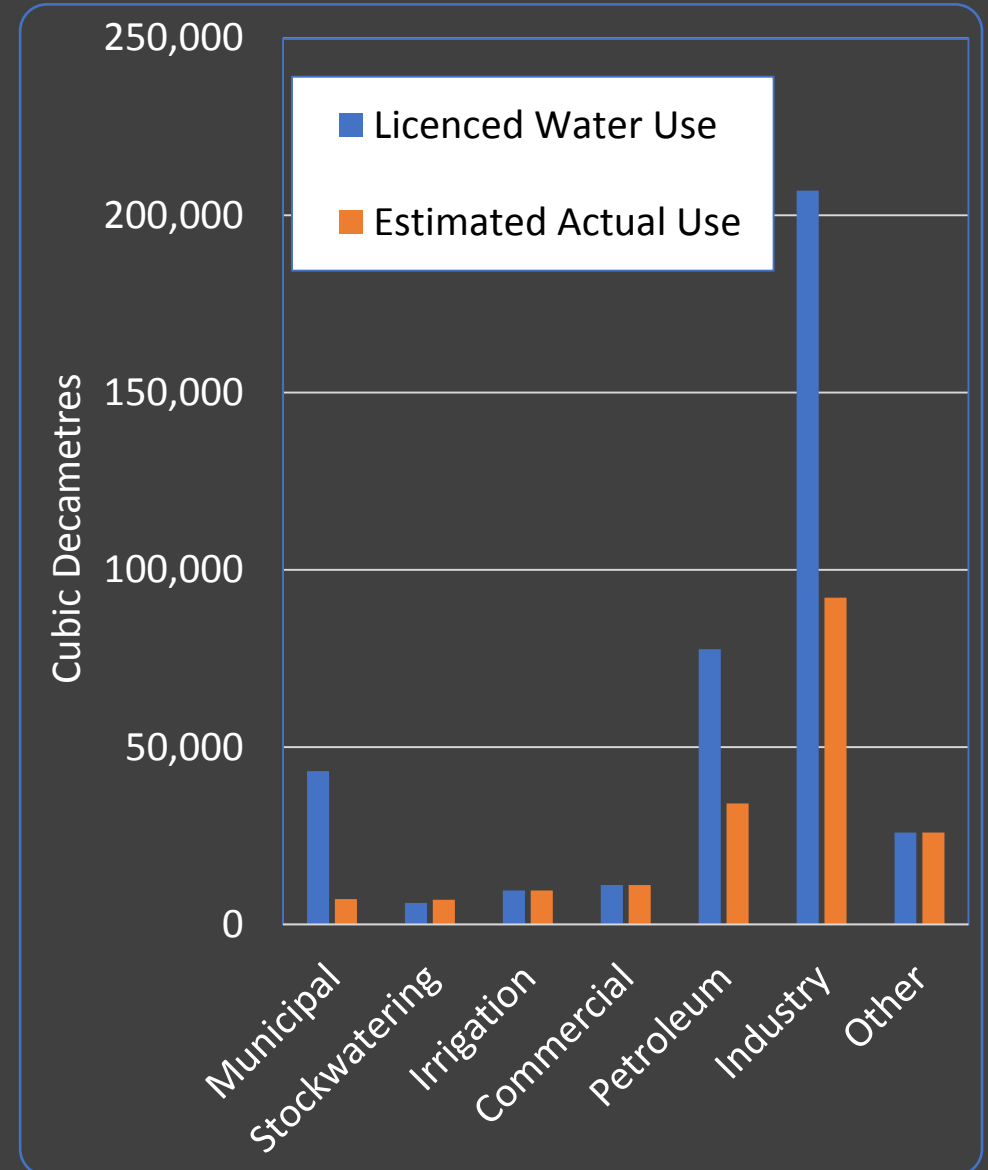
2007 Licenced Water Use

- **Terms of licences allowed 19% of water withdrawals to be consumed**
 - 0.38 million dam³ could be either consumed or lost
 - Industry could use 13% of licenced withdrawals
 - Municipal users could use 27%
- **81% of withdrawals were to be returned**



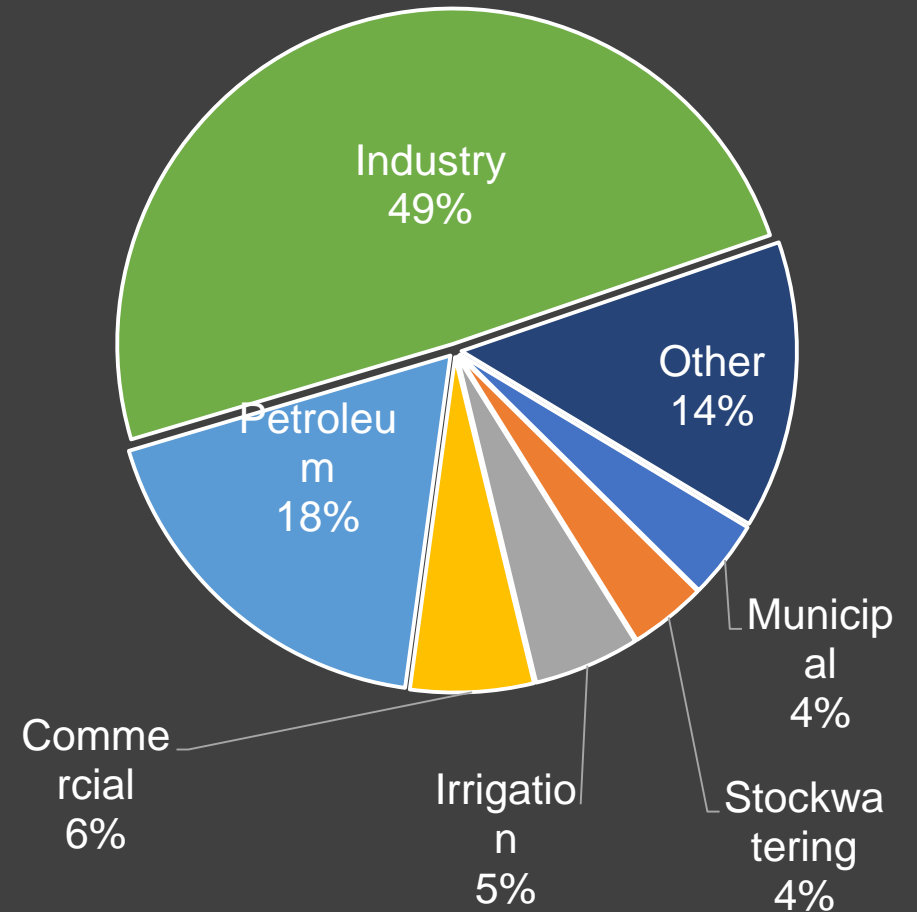
2007 Actual Water Use

- **Actual water use was determined to be 49% of licenced use**
 - 187,000 dam³
 - 2.6% of mean annual flow of the North Saskatchewan River
- **Not all licensees were using their full entitlements**
 - Industry – 45%
 - Not all projects operating at capacity
 - Municipalities – 16%
 - Licences include allowance for population growth
 - Petroleum - 44%
 - Licences issued when operations were at peak use
 - Other uses (assumed to be 100%)



2007 Actual Water Use

- Based on estimates of use:
 - Industry – 92,120 dam³
 - Petroleum – 34,100 dam³
 - Other – 25,900 dam³
 - Agriculture – 16,480 dam³
 - Commercial – 11,080 dam³
 - Municipal -7,070 dam³
- Actual use was only 9% of licenced withdrawals



2007 Actual Water Use

	Headwaters	Capital Region	Downstream	Total
Licenced Withdrawals	874,300 dam ³	1,029,600 dam ³	66,800 dam ³	1,970,700 dam ³
- percent of NSRB	44.4%	52.2%	3.4%	100%
Licenced Use	81,500 dam ³	258,900 dam ³	39,900 dam ³	380,300 dam ³
- percent of NSRB	21.4%	68.1%	10.5%	100%
Actual Use	71,200 dam ³	90,500 dam ³	25,100 dam ³	186,700 dam ³
- percent of NSRB	38.1%	48.4%	13.4%	100%
- percent of licenced withdrawals	8.1%	8.8%	37.5%	9.5%
- Industrial %	90.5%	30.2%	1.7%	49.3%
- Petroleum %	3.3%	24.2%	39.2%	18.3%
- Municipal %	1.3%	6.1%	2.4%	3.8%
- Agriculture %	1.3%	11.1%	22.0%	8.8%
- Commercial %	1.0%	9.1%	8.7%	5.9%
- Other %	2.6%	19.3%	26.0%	13.9%

2. THE 2007 WATER USE STUDY

Summary of Findings

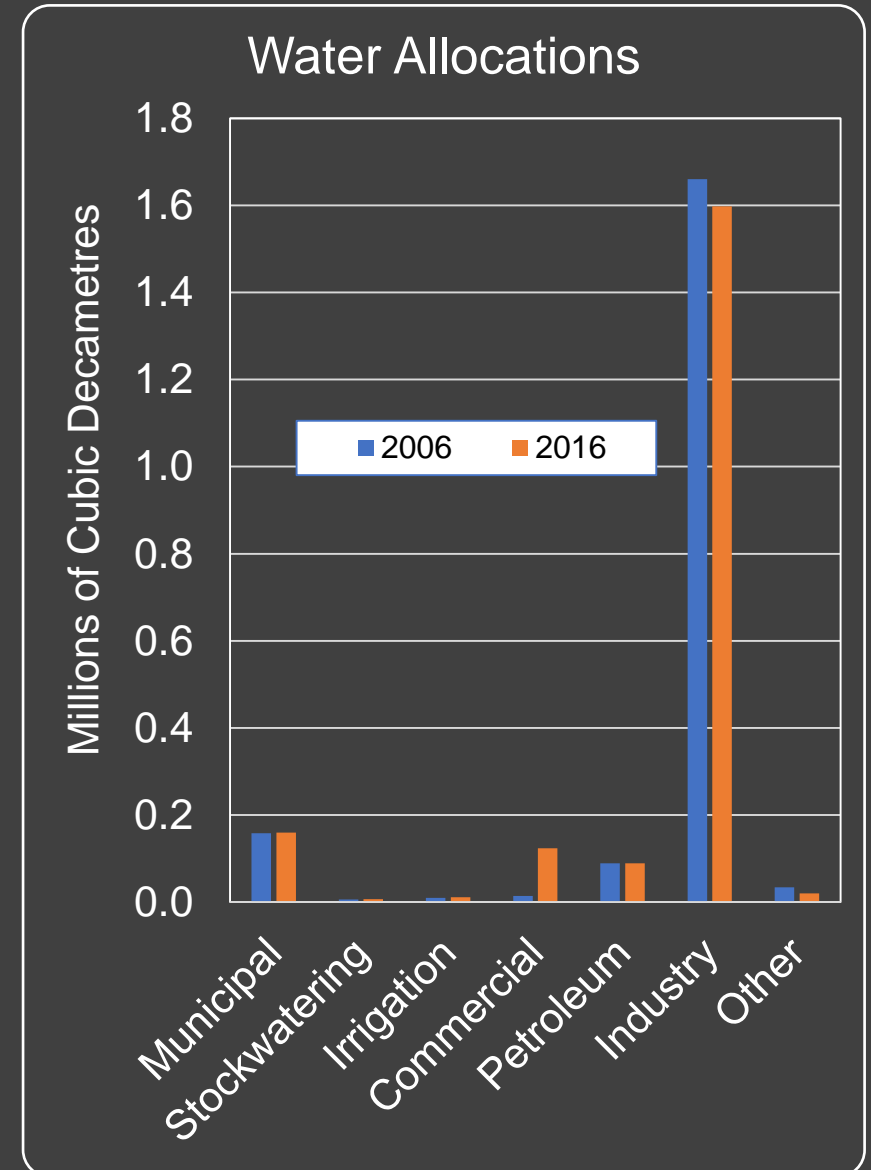
- **Licences allocated 1.97 million dam³ of surface water for withdrawal**
 - Industrial sector (cooling) accounted for 83% of allocations
- **Terms of licences allowed 19% of water withdrawals to be consumed**
 - 0.38 million dam³ could be either consumed or lost
 - 81% of withdrawals were to be returned
- **Actual water use was determined to be 49% of licenced use**
 - 187,000 dam³
- **Water allocations and use were concentrated in the Capital Region**
 - 90,473 dam³ was used– 12% of allowed water use
- **Headwaters area also accounted for large allocation**
 - 71,175 dam³ was used – 9% of allowed water use
- **Downstream sub-basins have small water use**
 - 25,096 dam³ was used– 93% of allowed water use

2. THE 2007 WATER USE STUDY

- Represented a best guess of actual water use
 - Very few licensees were actually reporting annual water use at that time and even fewer reported return flow
 - Data only for the biggest users
 - Some licensees are not required to report
 - Some uses (domestic) are not licenced
 - Some licences still on the books but not actually being used

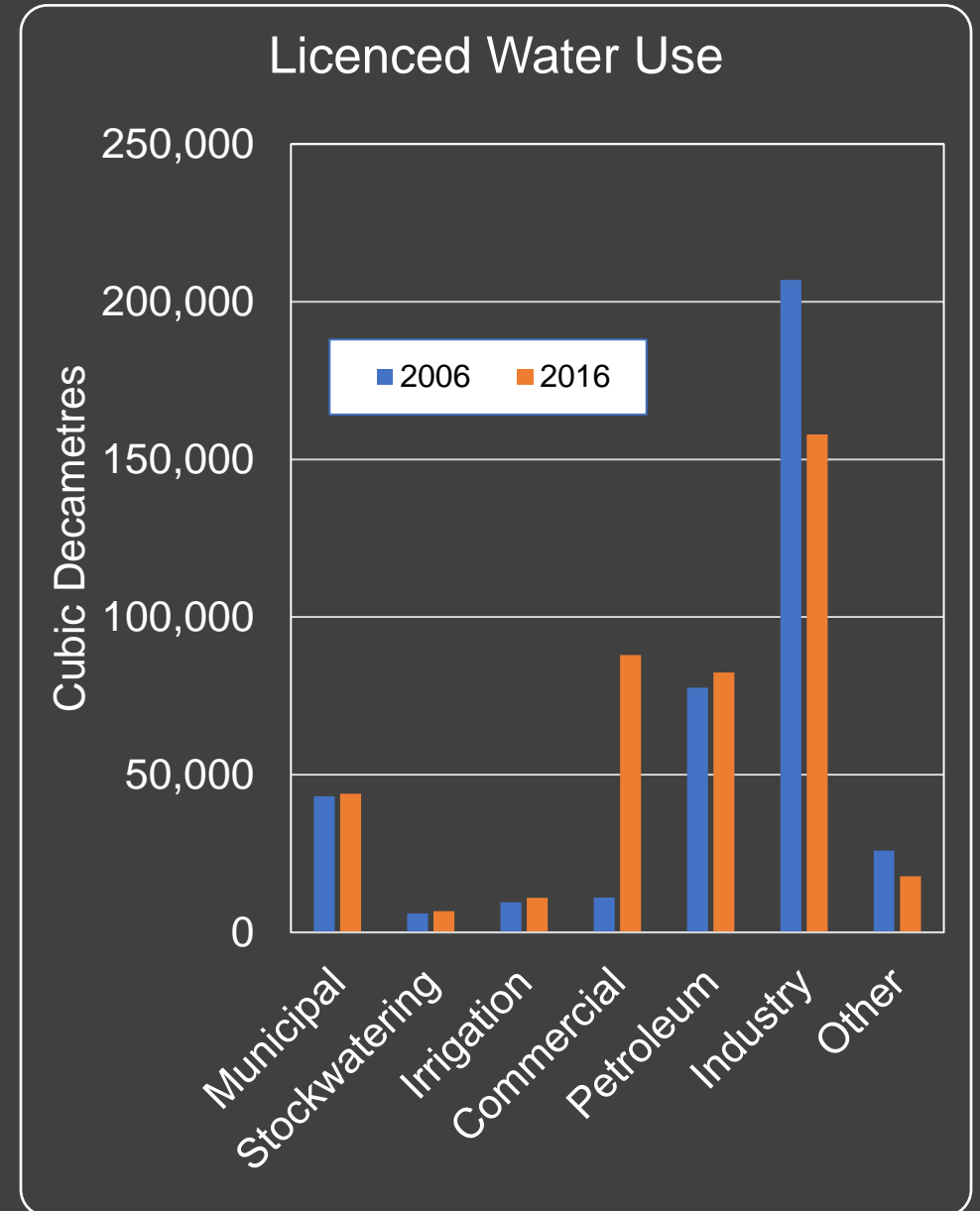
3. 2016: WHAT HAS CHANGED?

- **Water allocations through licences have increased since 2006**
 - 2.01 million dam³ allocated in 2016
 - Increase of 38,330 dam³ (2%) from 2006
 - Largest increase in commercial water allocation
 - Increase of 109,520 dam³
 - Large decreases in some allocations:
 - Industrial use (-61,900 dam³)
 - Other purposes (-13,540 dam³)
 - Small increases for some other uses
 - Municipal (1,350 dam³)
 - Irrigation (1,503 dam³)
 - Petroleum (712 dam³)



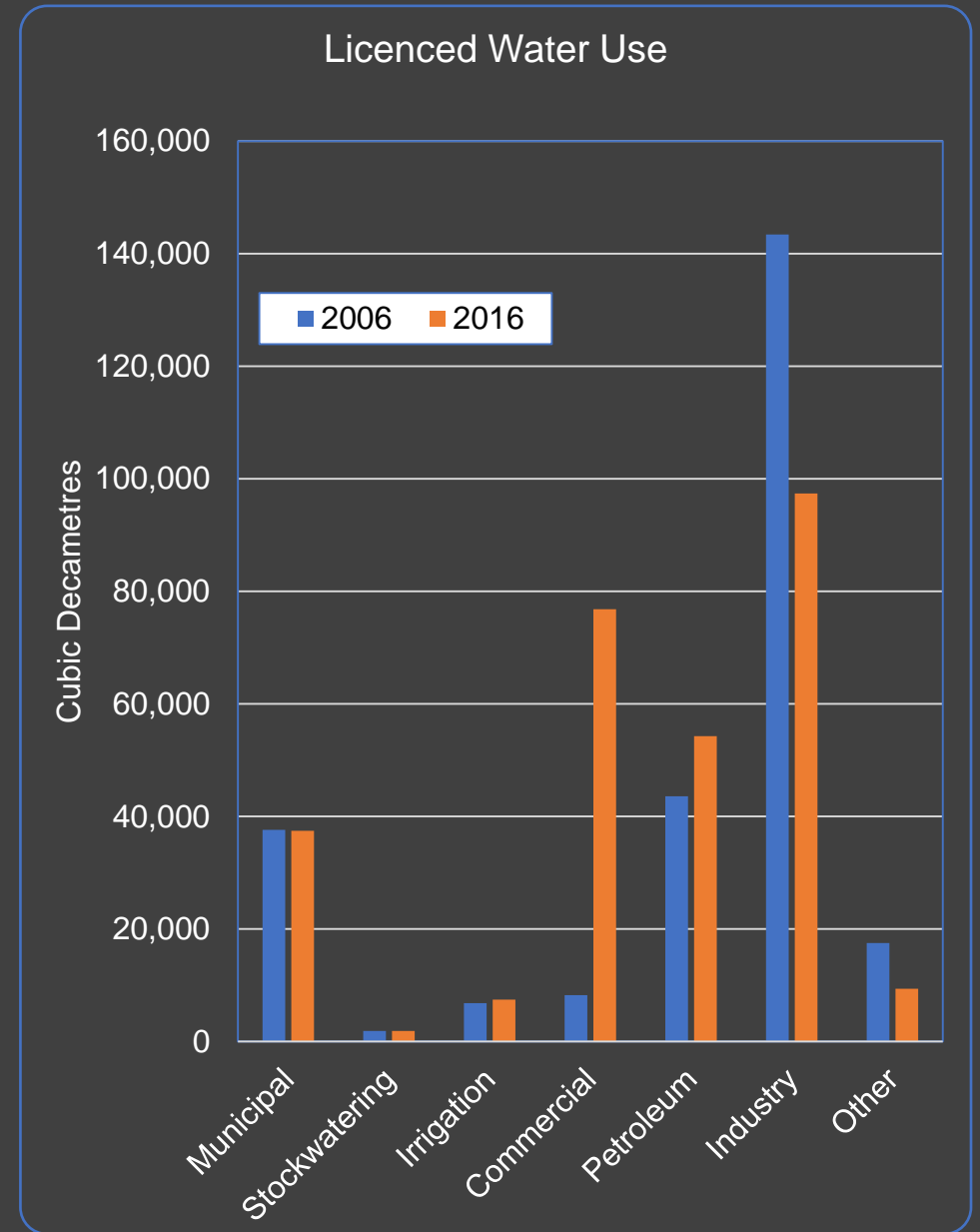
3. 2016: WHAT HAS CHANGED?

- **Licensed water use has increased since 2006**
 - 407,634 dam³ allocated in 2016
 - Increase of 27,360 dam³ (7.0%) from 2006
 - Large increase in commercial licenced water use
 - Increase of 76,900 dam³
 - Large decrease in industrial licenced water use
 - Decrease of 49,100 dam³
 - Large decrease in other licenced water use
 - Decrease of 21,500 dam³
 - Small increase for petroleum use
 - Increase of 4,800 dam³



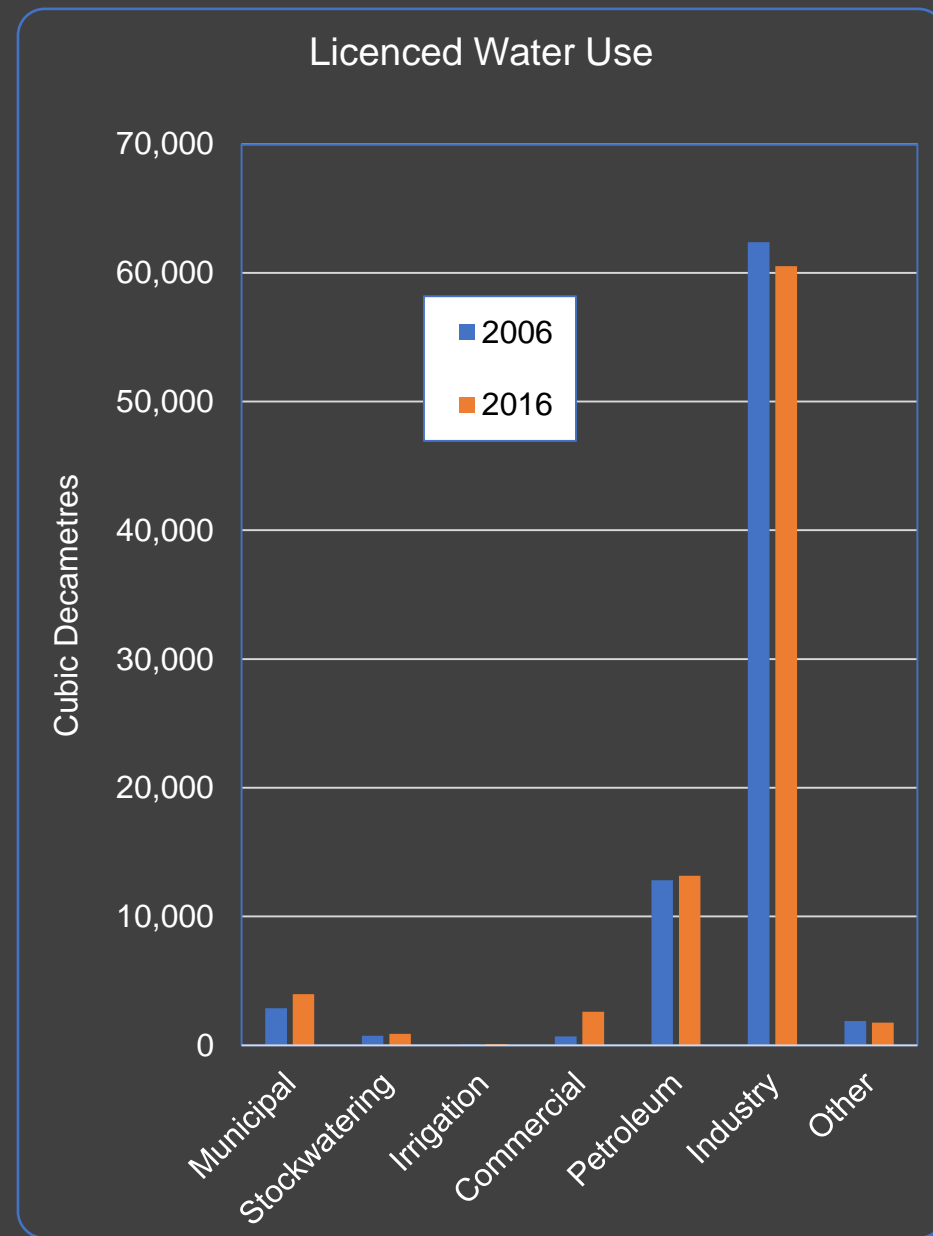
3. 2016: WHAT HAS CHANGED?

- **Water allocations and use increased slightly in the Capital Region**
 - Compared to 2006, current licences allow:
 - Withdrawal of 2% more water
 - Use of 10% more water (25,500 dam³)
 - Major increase in allowed water use for commercial purposes
 - 68,600 dam³
 - Small increase in allowed water use for petroleum purposes
 - 10,700 dam³
 - Reductions in allowed water use for :
 - Industry (-46,000 dam³)
 - Other (-8,100 dam³)
 - **Capital Region accounts for 70% of licenced surface water use in the NSRB**
 - Up from 68% in 2006



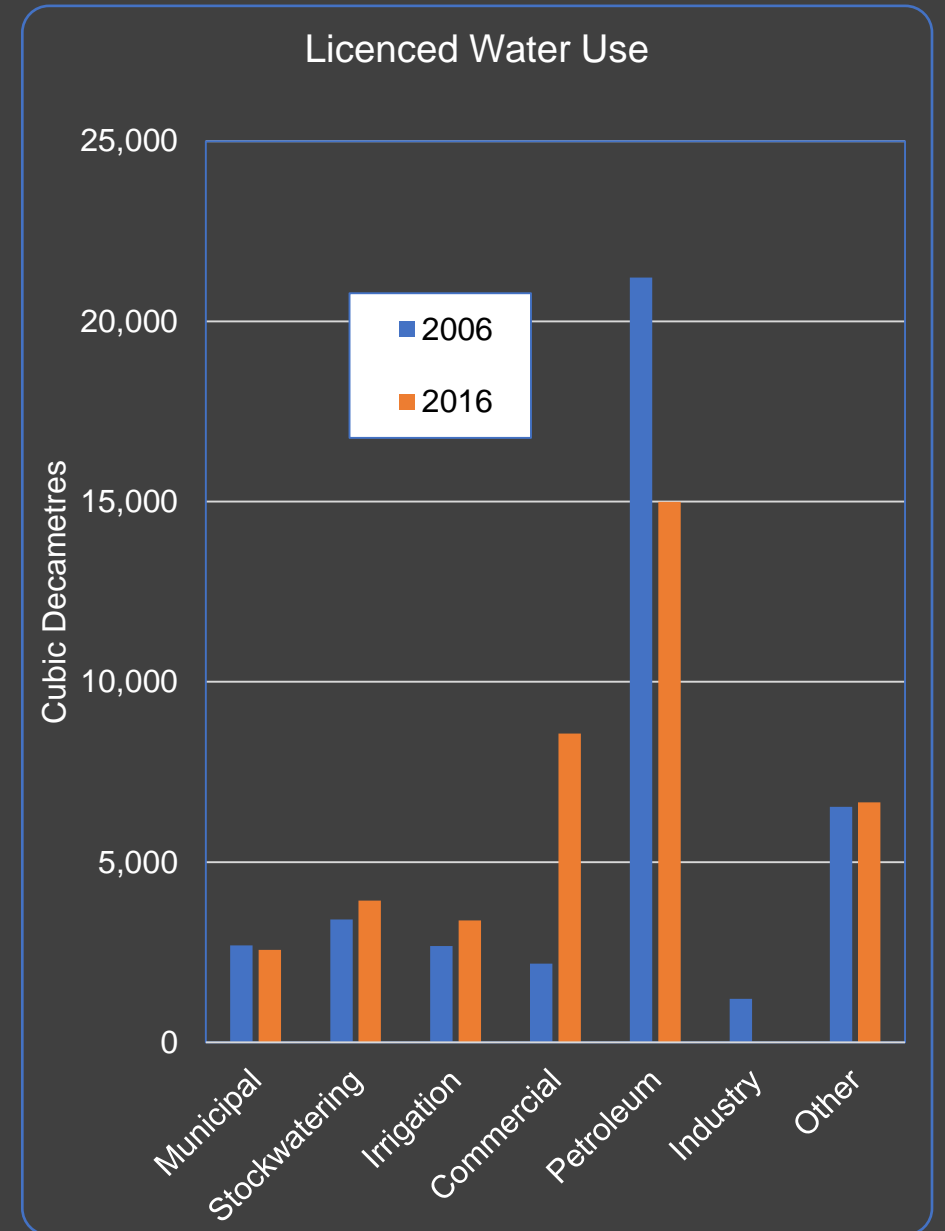
3. 2016: WHAT HAS CHANGED?

- **Water allocations and use increased slightly in the Headwaters Region**
 - Compared to 2006, current licences allow:
 - Withdrawal of 2% more water
 - Use of 2% more water (1,560 dam³)
 - Major increase in allowed water use for commercial purposes
 - 1,920 dam³
 - Large decrease in allowed water use for industrial purposes
 - -1,850 dam³
 - Wabamun power plant shut down in 2010
 - Increase in allowed water use for:
 - Municipal (1,100 dam³)
 - **Headwaters Region accounts for 20% of licenced surface water use in the NSRB**
 - Down from 21% in 2006



3. 2016: WHAT HAS CHANGED?

- **Water allocations and use increased slightly in the Downstream Region**
 - Compared to 2006, current licences allow:
 - Withdrawal of about the same amount of water
 - Use of 1% more water (200 dam³)
 - Major increase in allowed water use for commercial purposes
 - 6,390 dam³
 - Small increase in allowed water use for agricultural purposes
 - 1,235 dam³
 - Decrease in allowed water use for:
 - Petroleum (-6,220 dam³)
 - Industry (-1,200 dam³)
 - **Headwaters Region accounts for 10% of licenced surface water use in the NSRB**
 - Same as in 2006



2016: CHANGES IN MUNICIPAL WATER USE

- Increased municipal population
 - Population of the basin has increased by 26% since 2006
 - Now 1.45 million people
 - An increase of 295,000 people
 - 97% of the increase has been in the capital region.
 - Water allocations in municipal licences have increased by about 1% since 2006
- Basin population served by EPCOR has increased
 - 82% of basin population in 2006 (1.08 million people)
 - 86% of basin population in 2016 (1.25 million people)
- However, volume of water treated by EPCOR has remained relatively the same
 - 2.2% increase between 2006 and 2016
 - Average volume of treated water has decreased from 383 litres per person per day in 2006 to 296 L/P/D in 2016

2016: CHANGES IN MUNICIPAL WATER USE

- Thus, water use in the capital region has remained relatively unchanged over last 10 years
 - Due to improved water efficiency
 - Low flow toilets – new construction and retrofits
 - High efficiency appliances (washing machines and dishwashers)
 - Improved water line efficiency – fewer main breaks
- Outlook for Future
 - EPCOR estimating 3.3% increase in water production between 2016 and 2020
 - Expect increasing number of customers offset slightly by decreasing consumption per customer

2016: CHANGES IN INDUSTRIAL WATER USE

- **Water allocations through licences have decreased**
 - Water allocations have decreased by 4% since 2006
 - However, water use allowed in licences has decreased by 24%
 - Cancellation of some licences and higher return flow requirement in new licences?
- **Closure of Wabamun power plant has resulted in reduced withdrawals**
 - 2 licences represent 46% of water licences issued for industrial purposes
 - Still on the books
- **Incomplete water use data**
 - **Withdrawal data reported for 20 of 27 licences**
 - Account for 74% of industrial allocations
 - Only withdrawing 11% of entitlements
 - **Return flow reported for 11 of 27 licences**
 - Account for 34% of industrial allocations
 - Cannot accurately estimate actual water use without return flow data

2016: CHANGES IN INDUSTRIAL WATER USE

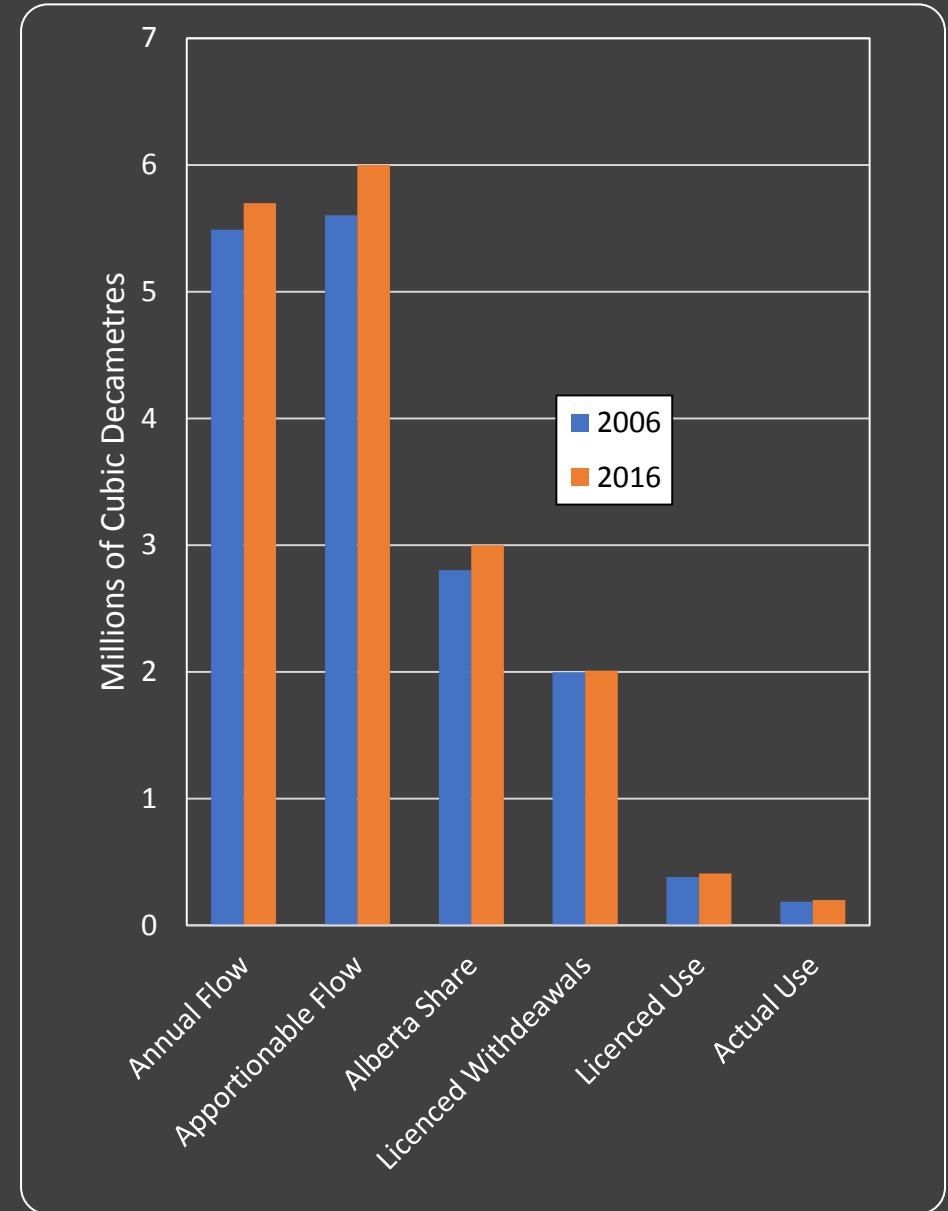
- Best guess is that industrial water use in 2016 is lower than 2006
 - Non-use of Wabamun licences
 - Low use of allocations by those who did report.
- Outlook for future
 - Possible increase as new gas fired power plants are developed
 - Power industry CEP Plan showed that gas fired cogeneration and combined cycle generation that replaces coal units as they are retired would require much less water per kwh.
 - Expect almost no increase in water use from 2002 baseline to 2029 despite doubling of power generated.
 - From 100,300 dam³ in 2000-02 to 108,500 dam³ in 2029
 - From 1.7 dam³ per GWh in 2000-02 to 0.8 dam³ per GWh in 2029

3. 2016: WHAT HAS CHANGED?

- Actual water use about the same or slightly lower than in 2006
 - Lower industrial use through improvements in water use efficiency
 - Municipal water use growing slowly
 - Efficiency improvements will continue to offset some demand increases from population growth
- Still easily meeting Apportionment Agreement commitments
 - Recorded flow at the Alberta- Saskatchewan border in 2015 was 5.7 million dam³
 - Apportionable flow was estimated to be 6.0 million dam³
 - Assumes consumption was 0.3 million dam³
 - Actual consumption was likely less than 0.2 million dam³
 - Alberta could have consumed 10 times as much water and still met the Apportionment Agreement requirements

4. SUMMARY AND FUTURE CHALLENGES

- **Water allocations and use have changed little since 2006**
 - Licenced withdrawals increased by 2%
 - Licenced use increased by 7%
 - Estimated actual use increased slightly
 - Licences allow users to withdraw between 65% and 70% of Alberta's share under the Apportionment Agreement
 - However, Alberta is actually using a very small portion (6.7%) of its share



4. SUMMARY AND FUTURE CHALLENGES

- More water use data is not required to meet basin-wide management objectives
 - Current use represents about 5% of Alberta share of North Saskatchewan River flows
 - Water use information being provided by the big users (industry, petroleum and EPCOR) provides reasonable understanding of actual water use
- However, NSWA is regularly asked to participate in water management studies for sub-basins, for some reaches of tributary rivers, and for lakes
 - Water shortages appear to be an issue in some areas (Sturgeon River, for example)
- Need to increase quantity and quality of water use data for all users in some sub-basins
 - Essential for understanding demand/supply balances in sub-basins
 - Allows better estimates of natural flows
 - May lead to requirements for instream flows

4. SUMMARY AND FUTURE CHALLENGES

- Still many unknowns
 - While increased numbers of big users are reporting withdrawals, still missing information on return flows
 - Industrial
 - Petroleum
 - Poor reporting in many sectors
 - 8 of 34 municipal licences reported withdrawals in 2016
 - 10 of 156 irrigation licences reported withdrawals in 2016
 - 93 of 250 commercial licences reported withdrawals in 2016
 - Not sure if all these licences have been issued an addendum that requires them to report
 - No information on temporal pattern of withdrawals
 - Annual totals only
 - No monthly or seasonal data