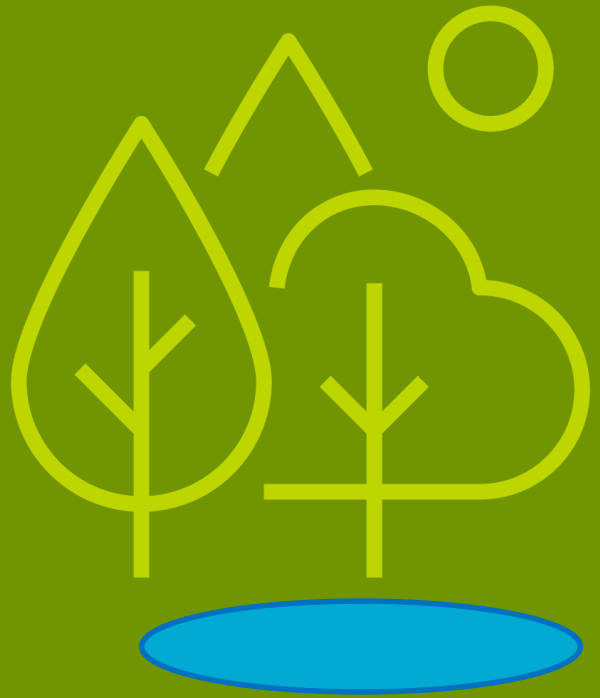
Surface Water Allocation Directive



Information Session

Alberta Environment and Parks
Water Policy
Fish and Wildlife Habitat Policy
Edmonton, AB Oct 2, 2018

Surface Water Allocation Directive

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Agenda

Surface Water Allocation Directive

- Background and Watershed assessment
- Rivers assessment
- Lakes assessment and Best practices
- Next steps and timelines

Questions after each section and at end of presentation

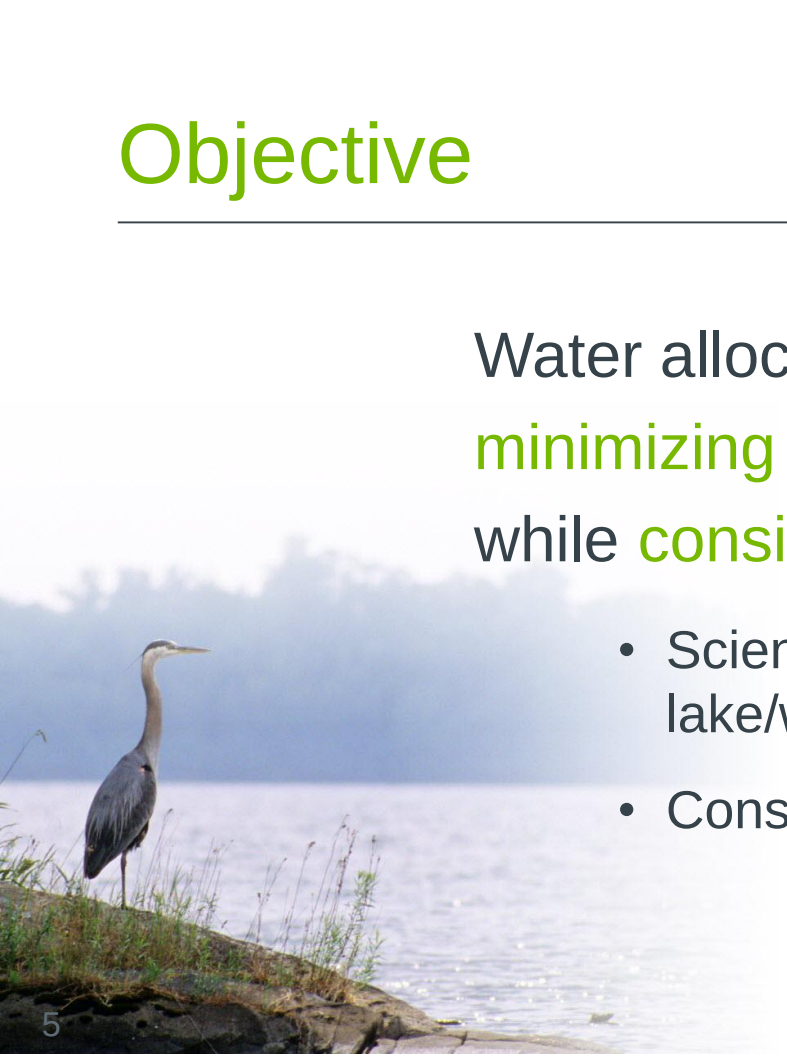
Opportunity to provide comments via online survey (Oct 1 - 31)

https://talkaep.alberta.ca/surfacewaterallocation

Background and Watershed assessment

- Objective
- Science and rationale
- Policy context
- Approach

Objective



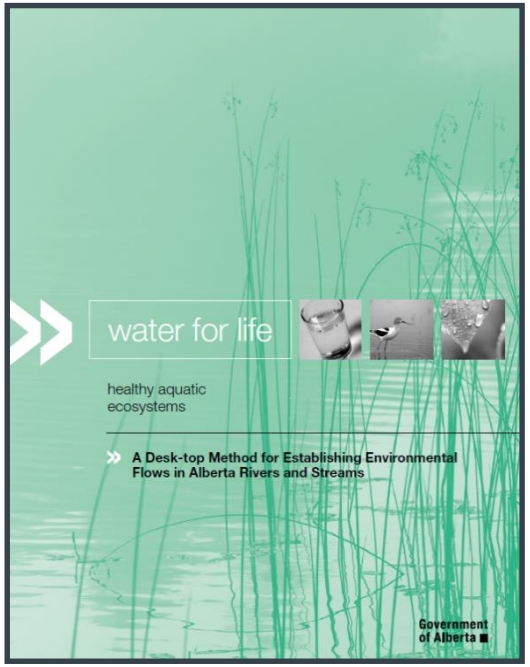
Water allocation guidance to balance minimizing impacts to the aquatic environment while considering economic water needs.

- Science-based rulesets for river/stream and lake/wetland water allocation
- Consistent and predictable across the province

Based on the Alberta Desktop

Objective: Full protection of the riverine environment

No measureable environmental decline over the long term due to human changes in the flow regime.



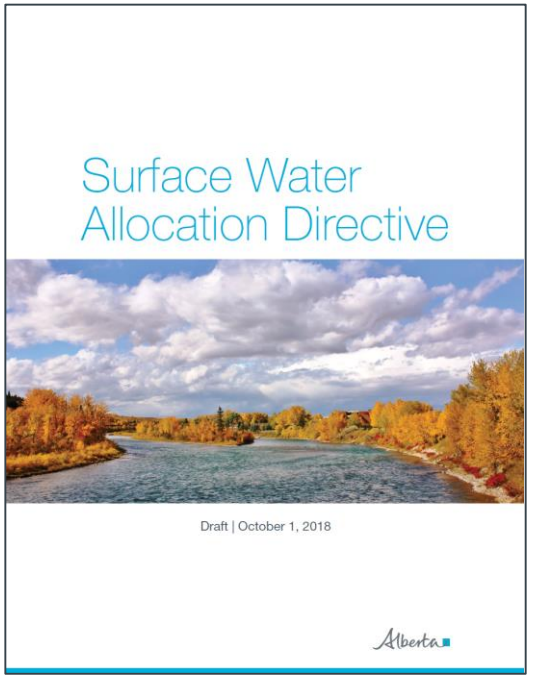
Locke & Paul 2011

…but different

Objective: Minimize impacts to the aquatic environment while considering economic water needs

Intended to support all outcomes of *Water for Life*:

- healthy aquatic ecosystems
- reliable, quality water supplies for a sustainable economy
- safe, secure drinking water



Alberta Desktop

- Guideline for water allocation
- Provides full protection of the aquatic environment
- Ecosystem base flow (cut off) for all rivers and streams
- Same limits for all stream sizes
- Does not provide guidance for lakes

Directive

- Policy for water allocation
- Considers both healthy environments and human water use for a sustainable economy
- Ecosystem base flow for small to medium rivers and streams; no cut off for larger rivers
- Provides increased protection for smaller systems
- New guidance for standing water bodies

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Policy context

Primary legislative basis is the *Water Act:*

- Does not affect existing licences
- Applicable to all temporary diversion licences and new licences
- May be applied at time of licence renewal
- Applicable to all sectors

Policy context

Directive does **not** replace or override other policy, regulations, legislation:

- Ministerial Order or decision of the Lieutenant Governor in Council
- Water management plans, water conservation objectives
- Land-use or environmental management frameworks
- Transboundary agreements and fisheries management objectives

Addresses the gap where no guidance currently exists

Policy context

For example, the Directive does not apply in the South Saskatchewan River Basin

Watershed Assessment (W1)

Water balance approach to determine if the proposed diversion is sustainable

A proposed diversion is considered cumulatively with other allocations

- evaluate environmental risk
- impact to existing users of the water source

Watershed can sustain the proposed diversion when:

Yearly cumulative allocations ≤ 12% mean annual flow

Low risk allocation screening

- For a significant number of licence applications, volumes applied for:
  - Are relatively small, and/or one-time or short-term;
  - Are small relative to the size of source

- Administrative resources best directed to applications with potentially greater risk to aquatic environment and other water users

Low risk allocation screening

- Low-risk screening criteria does not mean applications above the screening criteria are high-risk

- Screening criteria for flowing and non-flowing waters presented in following sections

Questions?

Rivers Assessment

- Rationale
- Method
- Low risk screening criteria

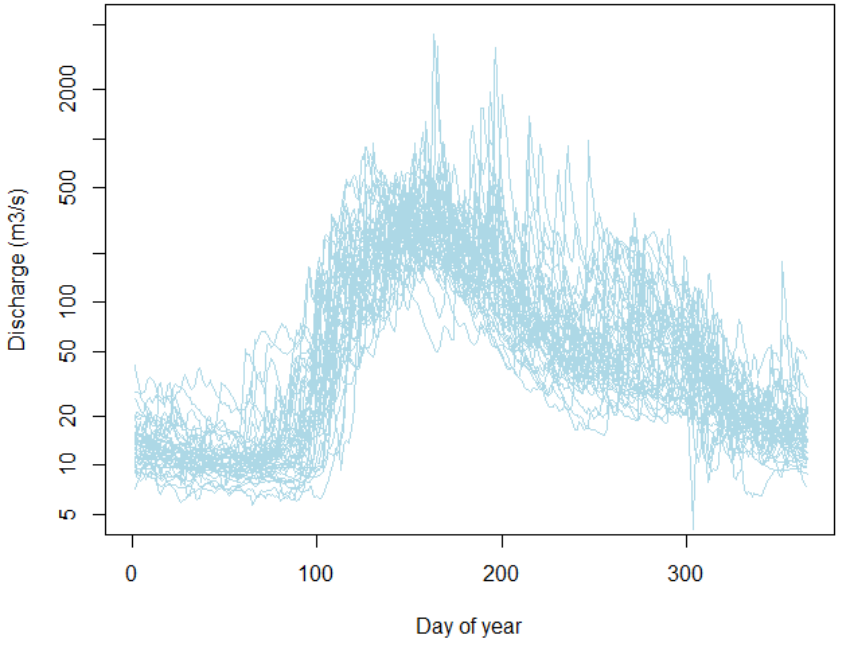
Alberta Desktop

Mean Annual Discharge - Known (m^3/s)	Mean Annual Discharge - Unknown Stream Order	Natural Weekly Flow (% exceedance) >Q80	≤Q80 - >Q95	≤Q95
≥10	≥7	15%	0%	0%
≥2 - <10	5 or 6	15%	0%	0%
<2	≤4	15%	0%	0%

- Alberta desktop method based on **percent of natural flow** and **ecosystem base flow components**

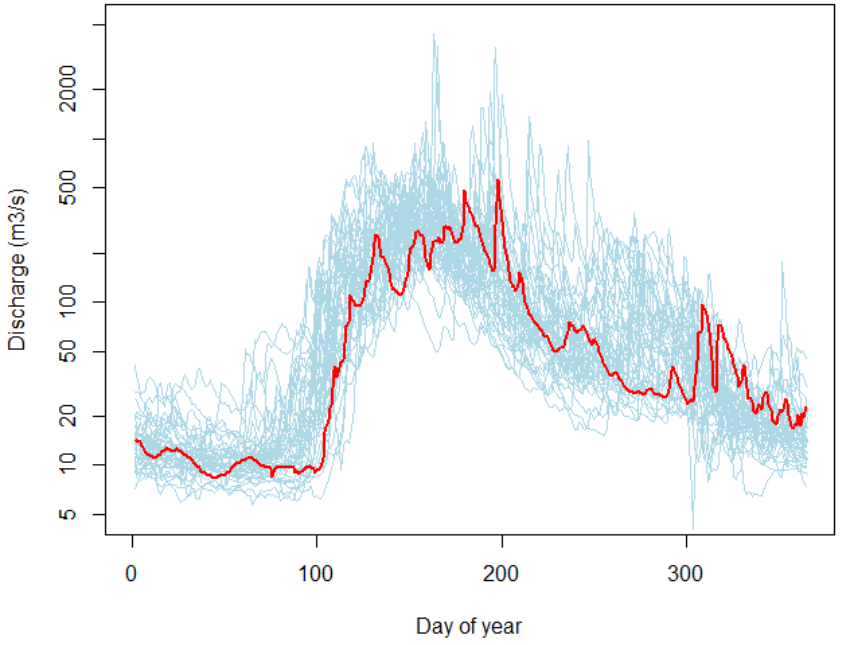
Alberta Desktop

Naturalized flows in Wapiti River near Grande Prairie



Alberta Desktop

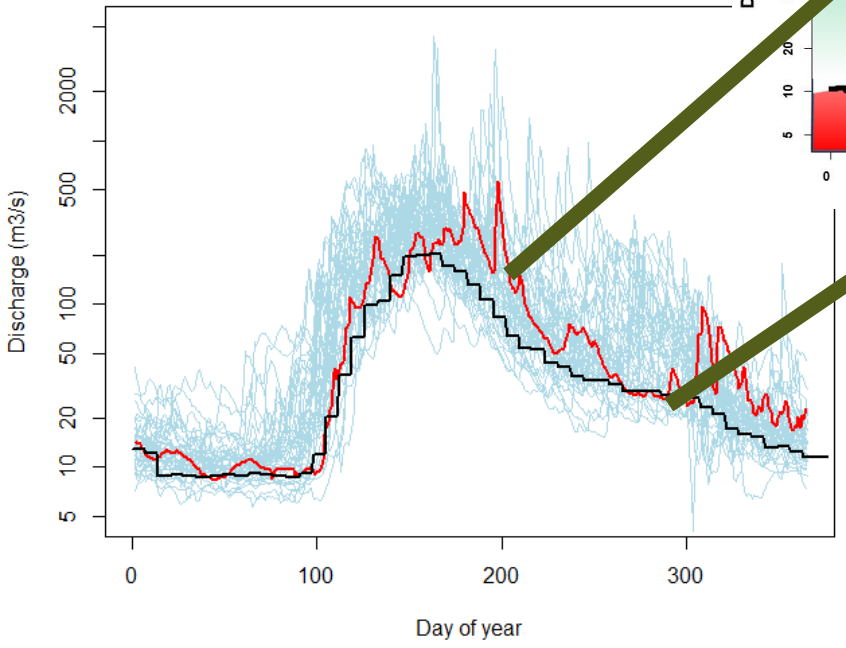
Naturalized flows in Wapiti River near Grande Prairie

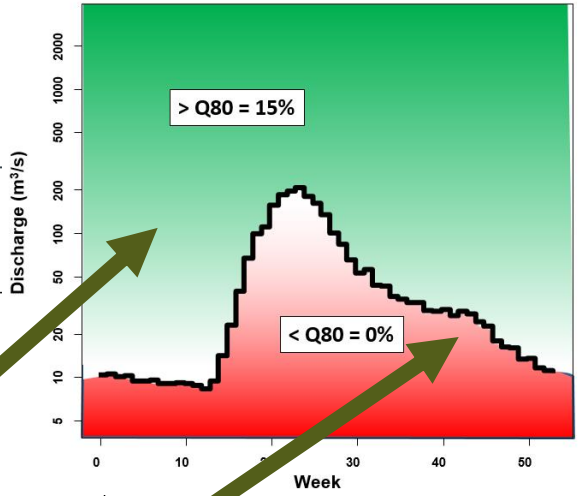


1975

Alberta Desktop

Naturalized flows in Wapiti River near Grande Prairie





1975

Q80 (20% flows below)

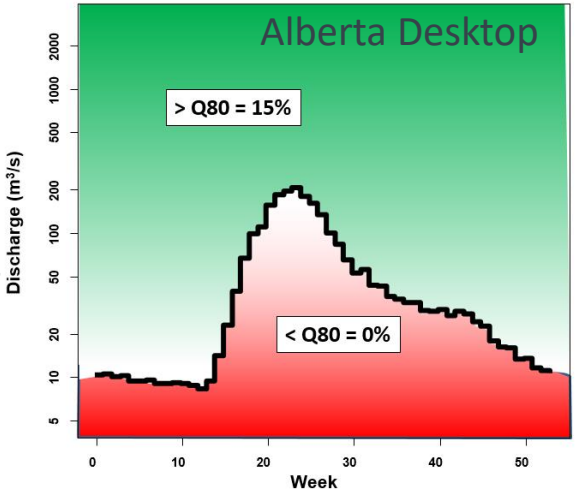
Directive approach – Rivers

- As in the Alberta desktop method, river limits are based on the percent of natural flow component and an ecosystem base flow component
- Ecological flow requirements may be proportionally greater in smaller systems (Rosenfeld et al. 2007)
- Smaller systems are provided greater protection
- Larger systems allow feasibility for social/economic considerations but still protective

Rosenfeld et al. 2007. Can. J. Fish. Aquat. Sci. 64: 755-767

Rivers Assessment (R1)

Mean Annual Discharge - Known	Mean Annual Discharge - Unknown	Natural Weekly Flow (% exceedance)		
(m^3/s)	Stream Order	>Q80	≤Q80 - >Q95	≤Q95
≥10	≥7	15%	5%	5%



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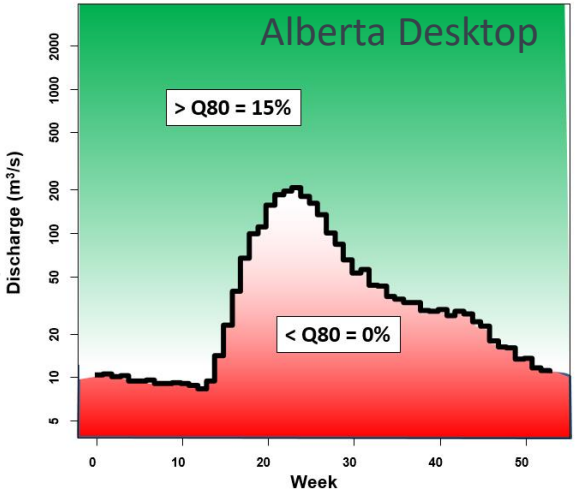

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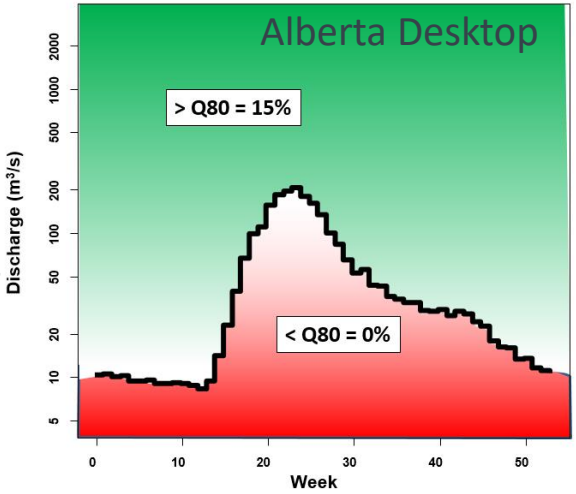


Screening criteria for lower-risk applications – rivers

Low risk screening for rivers

May to October Stream Order	November to April Stream Order	Allocation (m^3)	Maximum Diversion Rate (m^3/s)
1 and 2	1, 2 and 3	100	0.010
3	4	200	0.010
4	5	500	0.015
5	6	1,000	0.020
6	7	2,500	0.030
7+	8+	5,000	0.040

Questions?

Lakes Assessment and Best Management Practices

- Approach
- Lakes ruleset
- Low risk screening criteria

- Best management practices

Lakes: considerations and constraints

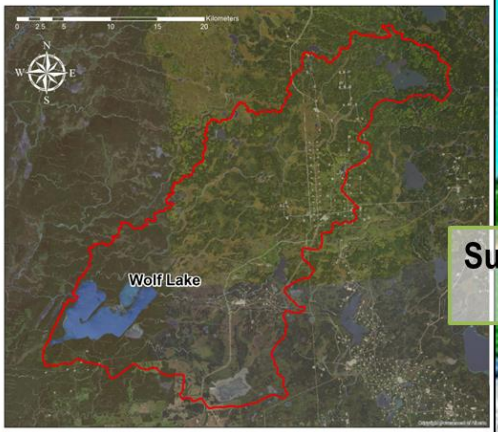
- **Flowing and non-flowing water bodies** co-exist and are connected within watersheds:
  - *How to align with an existing Alberta desktop method created for rivers and streams?*
- Lakes and other water bodies have one important characteristic that distinguishes them from flowing systems – capacity to **hold and store** water

Lakes: considerations and constraints

- Streamflow data is scalable across similar watersheds, but lakes are driven by **individual geography** and **relative contributing watershed size**
  - Creating generalized rules comparatively more difficult.
  - Alberta has tens of thousands of individual water bodies across many orders of magnitude of size – the majority having virtually no specific physical information or recorded data.

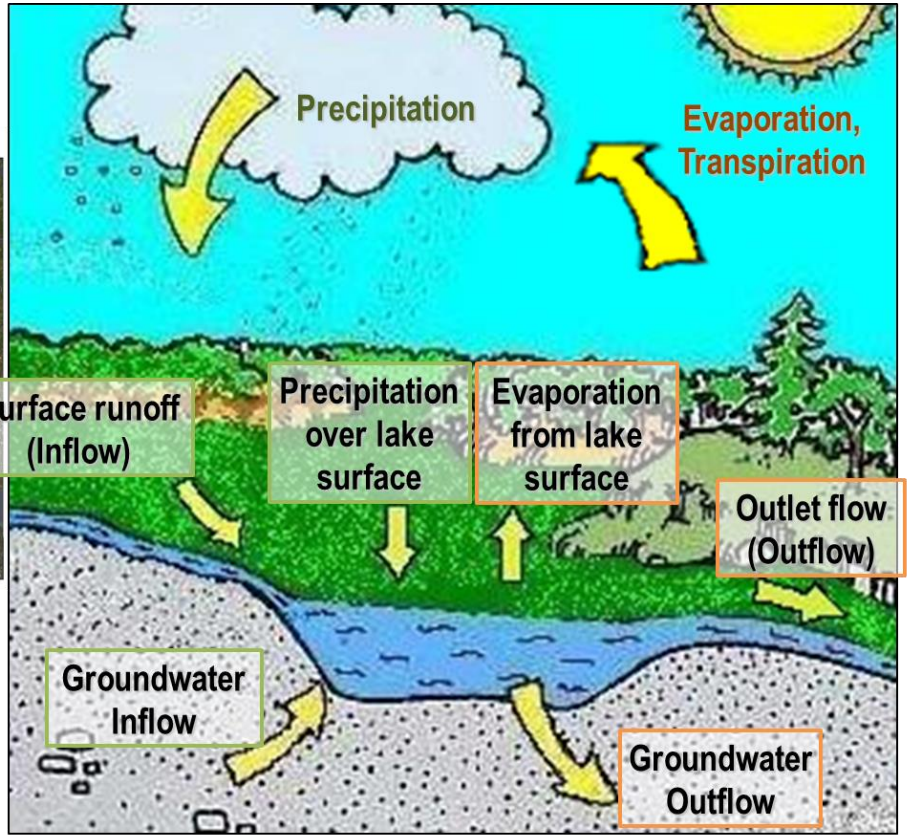
The fundamental premise for **lakes** and **other non-flowing water bodies** is to take a water balance approach

Water balance – main components



Lake surface area

Contributing watershed area



Water balance equation

- For any time step:

$$Inflow(s) \pm Change\ in\ Storage = Outflow(s)$$

Where:

  - Inflows are hydrologic contributions to the water balance (water coming into the water body)
  - Outflows are hydrologic deductions to the water balance (water leaving the water body)
  - Change in Storage is the difference in water level in the water body (converted to a volume of water)

Inflow components

- **Direct precipitation** contributes as rain and snow water equivalent, falling and accumulating over the surface area of the lake
- **Surface runoff** contributes as overland and near-surface flow generated from the catchment area of the lake watershed (also called runoff yield)

Outflow components

- **Evaporation** deducts from the water balance as a loss occurring over the surface area of the lake
- **Lake outflow** deducts from the water balance based on the water level of the water body, and characteristics/properties defined by an outlet rating curve, for example:
  - sill elevation (bottom depth) of the outlet channel
  - shape (geometry) and slope of the outlet channel

Groundwater – *assumptions*

- Quantified groundwater discharge to a water body (inflow) and/or groundwater recharge from a water body (outflow) is generally unknown or unavailable
  - Estimates for some lakes have been attempted;
  - Anecdotal evidence may suggest lakes may be “net gaining” or “net losing” entities

  Unless evidence to the contrary, often assumed that over the long-term, the net groundwater flux is ~zero

Simplified long-term water balance

- For long-term estimated water balance, use annual time step and assume change in storage is zero
  (water body reverts to a mean level over long-term)

$$Surface\ Runoff + Direct\ Precipitation - Lake\ Evaporation\ (\pm Groundwater) = Net\ Outflow$$

Where Net Outflow is the **mean annual net water balance**, and must be greater than or equal zero for a perennial lake.

Criteria for lakes and other non-flowing water bodies

Wildlife Sensitivity (L1)

- Species sensitive to human disturbance
  - activity may cause nest abandonment, disruption and decreased survival
  - guided by federally mandated Recovery Plans
  - aligns with Master Schedule of Standards and Conditions, 2017

piping plover

trumpeter swan

great blue heron

colonial nesters

American white pelican

Wildlife Sensitivity Restriction

Sensitive wildlife species	Breeding season	Restriction
Trumpeter swan	April 1 – September 30	No water diversions during breeding season
Colonial nesting birds	April 15 – July 31	
Piping plover	April 15 – July 31	

Annual Allocation Limit (L2)

- Based on **mean annual net water balance** calculation (or the mean annual outflow)
- Provides a maximum annual allocation volume **= 12% of the mean annual net water balance**

Seasonal Allocation Limits (L3)

- Separate considerations for two defined seasons:
  - Open water criteria/limit (April-October; 7 months)
  - Under ice criteria/limit (November-March; 5 months)

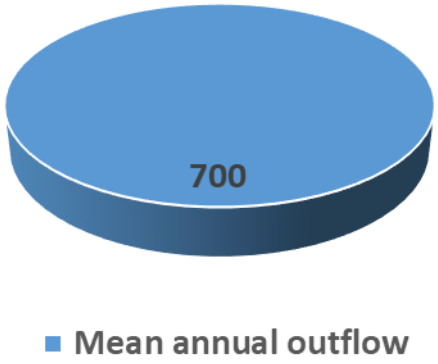
- Provides additional flexibility (open water season)
- Provides additional protective considerations in winter (most sensitive period)

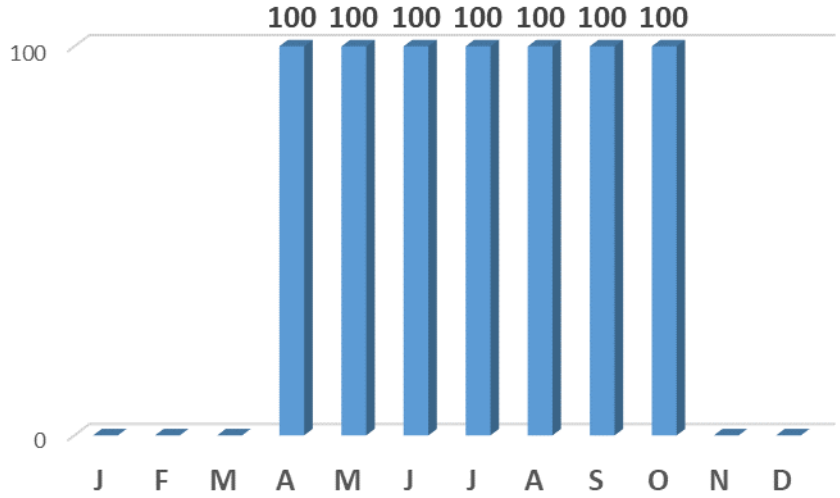
Open water (April-October)

- Approach taken:
  - The mean annual net water balance (mean annual outflow) occurs during the seven month open water period; and
  - The mean annual outflow is apportioned equally across those seven months

Open water (April-October)

- Approach taken:



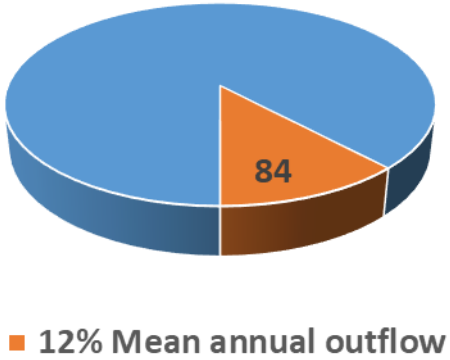


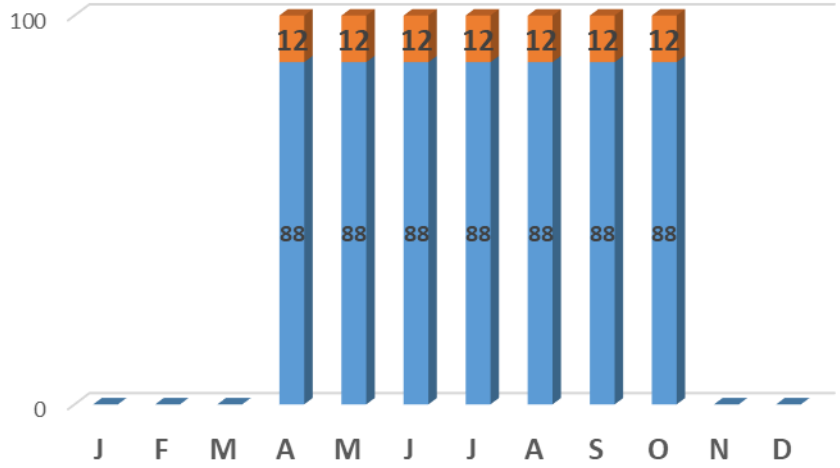
Open water (April-October)

- The maximum monthly allocation volume in the open water period
  = 15% of the apportioned mean monthly outflow

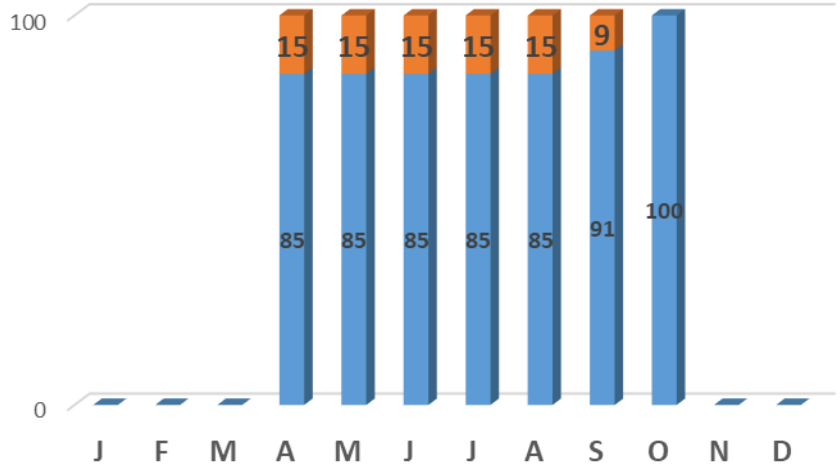
  And is capped
  to the annual allocation limit (12% of mean annual outflow)

Open water





e.g. “equal portions”



e.g. “15% portions”

Winter/Under ice (November-March)

- Approach taken:
  - Assumption of little/no outflow or hydrologic recharge
  - Assumption that diversions in winter/under ice will generally draw upon stored water

Winter/Under ice (November-March)

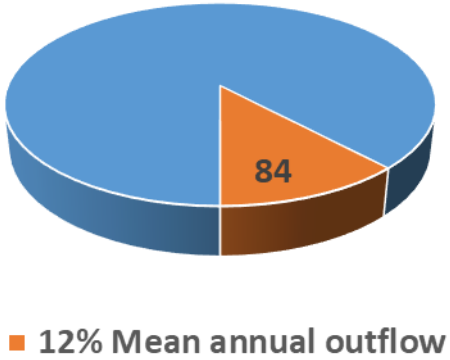
- The maximum monthly allocation volume for the under ice period **is the minimum of**:
  - The maximum monthly open water rate; or
  - A volumetric-equivalent depth limit of 4 cm/month, up to a 10 cm total maximum over the under ice period
- And,
  - Total volume allocated over the winter period must be less than 5% of the under ice lake water volume

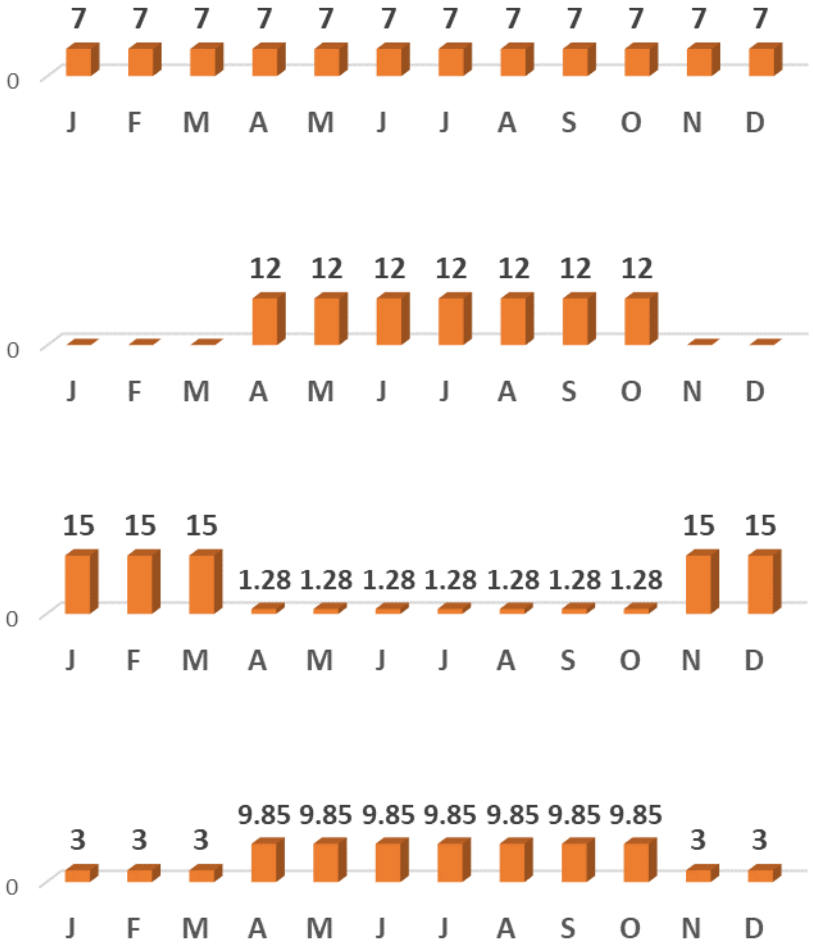
Maximum allocation is capped

- Regardless of flexible timing between open water and under ice, total annual volume diverted can not exceed maximum volume from the net annual balance, i.e. *12% of the mean annual outflow*
- And,
  Individual seasonal limits govern; winter limits may mean some volume is accessible only within open water season

Within annual limit

Examples for illustration only





Screening criteria for lower-risk applications – lakes and other non-flowing water bodies

Key risk factors

- For lakes/wetlands/non-flowing water bodies, there are two key considerations in assessing potential for impact:
  - Volume of allocation compared to volume of source (or, the equivalent potential drawdown depth);
  - How quickly the allocation is proposed to be diverted (how fast can the drawdown occur)

Low risk screening for lakes

$$[\boldsymbol{area}](\boldsymbol{ha}) > 0.06379 \times [\boldsymbol{allocation}]^{(0.776)}(\boldsymbol{m^3}) \times [\boldsymbol{max.rate}]^{(0.244)}(\boldsymbol{m^3/s})$$

"You need a minimum size of water body,
to sustain a diversion of specified volume and rate,
to not drop the water level too quickly"

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Low risk screening for lakes

- In addition, test for equivalent depth of 2 cm* or less (regardless of duration of diversion)
  - Addresses TDLs from ephemeral/seasonal water bodies

$$[\boldsymbol{area}](\boldsymbol{ha}) > [\boldsymbol{allocation}](\boldsymbol{m^3}) \div \mathbf{200}$$

- And $[\boldsymbol{allocation}] < 100{,}000\ \mathrm{m}^3$ regardless of water body size

* Must consider any previous or cumulative diversions; i.e. not go back to same water body repeatedly with multiple small diversions

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Best management practices

Best Management Practices

1. Select artificial water bodies over natural water bodies.
    - Water bodies which are not stocked and have no sportfish
    - Man-made flowing channels such as canals and ditches
    - Treated wastewater sources

2. Select larger mainstem rivers over small streams.
    - Preference to rivers and streams that do not support sensitive fish species
    - Avoid watercourses designated Class A (critical fish habitat protection areas)

3. Select larger, deeper lakes over small, shallow lakes.
    - Diversions from lakes in winter should be extracted from deeper water
    - Preference to non-fish bearing lakes and wetlands
    - Avoidance of lakes with significant public recreational use value (stocked ponds)

Best Management Practices

4. Screens on water intake equipment are required as per DFO.

5. Include water level monitoring (simple fixed reference level) in licensing conditions and standard clauses.
    - Measurement and reporting of data improves accountability and certainty for both licensee and regulator

6. Avoid amphibian breeding habitat from shallow water bodies (April 25 – May 31).

7. Avoid discharge into water bodies with piping plovers during breeding season (April 15 – July 31).

Questions?

Next steps and timelines

Opportunity to provide feedback and comments via online survey (October 1 - 31)

https://talkaep.alberta.ca/surfacewaterallocation

Timeline for final approval and publication of Directive is dependent on comments received

Questions?

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