



Pigeon Lake Weir

The Pigeon Lake control structure is a water management facility located in the southeast corner of the lake near Ma-Me-O Beach on Pigeon Lake Creek which flows into the Battle River. The weir was originally built in 1914 to control flooding of downstream hayfields (wetlands) due to summer storms. In 1986, after a period of high precipitation, the present structure was installed and the outlet channel reconstructed.

The structure is a two-bay structure with a fish ladder and operates with a weir elevation of 849.935 m above sea level (ASL). The Pigeon Lake Creek channel was cleared of debris and straightened to improve the outlet conveyance capacity from the weir to within 4 km of the Battle River (South of SE18-45-27-W4).

History of the Weir

- 1914** Weir first built to control flooding of downstream hayfields during summer storms
- 1940** Weir rebuilt
- 1980** Spillway cleared of debris, resulting in flooding of the hay fields
- 1986** New structure added (including a fish ladder). Pigeon Lake Creek channel cleared to Battle River resulting in the draining of wetlands
- 1987** Weir Licensed by AEP Water Right #22106
- 1993** Current AEP operating procedures established with municipal agreement



Figure 1. Map of the weir and Pigeon Creek

The main purpose of the weir is to protect the Pigeon Lake Creek channel from the sudden washing out of the natural sand bar which develops across the mouth of the creek and thereby releasing very large volumes of water from the lake to the downstream drainage systems.

Who owns and operates the weir?

Alberta Environment and Parks (AEP) owns and operates the weir. The Pigeon Lake weir is licensed under Water Right 22106 held by AEP. This license was issued February 02, 1987 and does not expire.

The Association of Pigeon Lake Municipalities, which include the twelve municipalities bordering Pigeon Lake, made recommendations in the 1990's to AEP on the operation of the weir.

What is the purpose of the weir?

The purpose of the weir is to control the rate of outflow from the lake during periods of high water. The uncontrolled flow of water under flood conditions has previously resulted in significant flooding of downstream locations, which was the original reason justifying the construction of the weir in 1914. The flow of water is attenuated by flowing over the weir in a controlled manner. The

How is the weir operated?

The weir operating procedures were set by the province to balance several concerns. These include mitigating downstream flooding of agricultural lands, managing lake storage volume in the event of flooding, minimizing shoreline erosion, ice damage, protecting habitat for fish and wildlife, and recreation.

Prior to 1992, the weir was operated with the weir elevation of 849.8 m ASL. At a meeting on November 22, 1992, the Association of Pigeon Lake Municipalities recommended the weir operation change in 1993 by installing one stop log to raise the spill elevation to 849.935 m ASL. The stop log would be removed when the water level reaches 850.09 m ASL and reinstalled at a water level of 850.01 m ASL. This would delay the flow of water from the lake during periods of high water but would also decrease the “surge capacity” of the lake in the event of storms.



Figure 2. Weir after construction in 1986

Fluctuating Lake Levels and the Weir

The main factor affecting the water level is the amount and pattern of precipitation in the watershed:

- For years with average precipitation and lake levels, the weir is operated with one stop log in place. Spring runoff and rains may cause water to spill over the weir for a short period of time. Later in the year, higher evaporation and lower precipitation result in water levels dropping below the weir stop log.
- During dryer climate cycles, lake levels tend to remain below the weir with no outflow.
- For extended periods of above normal precipitation, the lake level tends to rise above the weir with discharge through the outlet creek. When the lake level reaches the predetermined elevation of 850.09 m ASL, the stop log is removed to help control high water levels. When the level reduces to the elevation of 850.01 m ASL, the stop log is replaced. High lake levels present significant risk to the shoreline because of erosional forces of wave action in the summer and ice thrusts in the winter. See Pigeon Lake Water Level Fact Sheet

Lake Storage Capacity for Major Storms

Infrequently, a major storm will cause sudden and significant increases in water levels. For example, in 1990 a summer storm caused Pigeon Lake to rise 0.31 m from July 1st to 4th. The weir operating procedures are designed to maintain reserve storage to safely accommodate these storm events. The flood condition created by these events is accompanied by strong winds and waves which exacerbate shoreline erosion.

Frequently Asked Questions:

1. **Does the weir control the lake level?** The weir and downstream channel conditions in Pigeon Lake Creek help stabilize Pigeon Lake water levels for both wet and dry climate cycles. The level of the lake is primarily determined by the amount of precipitation received in any year. In sufficient amounts, the precipitation will offset the effects of evaporation and groundwater flow from the lake. When the lake level is below the spill point of the weir, in the absence of significant amounts of precipitation, the lake level will show significant rates of decline. When the level is above the spill point, the operation of the weir will only marginally reduce the rate of decline in level. This is because the flow rate over the weir is small in comparison to the evaporation rates.

2. **Will adding another stop log increase the lake level?** It is possible another stop log could result in incremental, long-term increases in average level, but would require full modelling water of level data, climate variability, storage capacity and impact assessment considering known factors and risks including flooding, significant shoreline erosion and property damage.
3. **Are the beaver dams in Pigeon Creek affecting water flow from the lake?** Beaver dams in close proximity to the weir could cause a backwater effect and thereby have some effect on the discharge rate. If beaver dams on Pigeon Lake Creek are located far enough downstream, there would be no backwater effect on the weir and therefore would have no impact on Pigeon Lake discharges.



Figure 3. Observations at the weir (starting with the top row) May 14 (50-year spring average), June 5 and June 24, 2020.

Data used in the factsheet can be found in the Pigeon Lake Watershed Management Plan- Appendix C, Technical Summary.

Special thanks to Alberta Environment and Parks for assistance in developing this information sheet.

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