

UPPER THAMES RIVER
CONSERVATION AUTHORITY

Wildwood Dam & Reservoir: Key Facts

1. Where are Wildwood Dam and Reservoir and what do they do?

Wildwood Dam and Reservoir were constructed in the early 1960s on Trout Creek, east of the Town of St. Marys. After passing through the structure, the creek flows another 7 km before joining the North Thames River in St. Marys. The Trout Creek watershed (i.e., all the land that drains into the creek) covers 162 square kilometres of mainly agricultural land.

Wildwood Dam and Reservoir were designed to manage flows in Trout Creek in order to benefit downstream communities, including St. Marys, London and beyond, by:

- Supplementing (augmenting) downstream flows in the drier summer months, and
- Reducing downstream flooding.

The dam and reservoir were also designed to provide recreational opportunities on and around the reservoir. An additional goal during all operations is to maintain sufficient water in the reservoir for aquatic habitat.

2. Why is the reservoir water level up during the summer and down during the winter?

The engineers who operate the dam and reservoir follow an annual cycle designed to meet the structure's key functions. In the late spring and early summer, the reservoir is at its "summer conservation level" (6.55 metres, which is 71.8% of capacity). Above this level, there is an additional 6.3 million cubic metres (m^3) of flood storage.

Beginning typically in late June, water is gradually released from the reservoir to supplement flows downstream in Trout Creek and the North Thames River. The minimum target flow released from the reservoir is 1.1 cubic metres/second (m^3/s). This additional flow supports water quality and aquatic habitat in the drier summer months, as well as human uses such as irrigation for agriculture, golf courses and by municipalities. During a dry summer, this release from Wildwood Reservoir provides 25% to 50% (or more) of the flow in the North Thames River.

The gradual release of water over the summer and fall results in the reservoir level slowly dropping. By late fall, the reservoir has been drawn down to its "winter holding level" (3 m or 26.7% of capacity). This provides increased flood storage while keeping sufficient water to protect aquatic habitat in the reservoir.

The reservoir is kept low during the winter to ensure there is room to temporarily store runoff from snowmelt and winter/spring rains. Most of this runoff is retained to raise the reservoir, until the reservoir approaches the summer conservation level.

Approximately 10 million m^3 of water are required to fill Wildwood reservoir from its winter holding level (3 m) to its summer conservation level (6.55 m). This volume is equivalent to 70 mm of water covering the entire drainage area of the reservoir.

3. How is the dam operated during a potential flood event?

During a potential flood event, Wildwood Dam temporarily stores water in the reservoir, thus reducing downstream flows in Trout Creek. How much the dam reduces downstream flood flows depends on many factors, including:

- How much runoff is coming in (rate and volume of flow into the reservoir),
- How much runoff the reservoir can hold (volume of storage available at the time),
- Time of year and where the reservoir is in the annual operating cycle (winter holding level, summer conservation level, or in between).

For example, in the early spring when the reservoir is low (i.e., near the winter holding level), runoff from both small and large snowmelt and/or rain events may be captured in the reservoir in order to store water for flow augmentation during the summer. Once the reservoir is higher (i.e., near the summer conservation level), there is less capacity to store runoff.

While at the summer conservation level, as the reservoir rises in response to runoff, it overtops baffle walls in the dam, increasing the discharge. The discharge continues to increase as the reservoir rises and the depth of water flowing over the baffle walls increases (similar to flow over a weir). Due to the dam's design, in order to utilize flood storage above the summer conservation level, the discharge over the baffle walls will inundate the natural flood plain downstream. Wildwood Dam was not designed or intended to prevent downstream watercourses from utilizing the natural flood plain.

The only way the reservoir could fill completely would be during an extreme runoff event, which has not occurred since the dam was constructed.

Trout Creek joins the North Thames River in St. Marys, 7 km downstream of the dam. Dam operations generally have a much smaller effect on flows in the North Thames, as the dam manages flows only on the Trout Creek watershed, which is a small proportion (13%) of the North Thames watershed upstream of the town.

During the February 2018 flood, Wildwood Dam operations reduced maximum flows on Trout Creek from 65 m^3/s to 21 m^3/s, a reduction of 68%. In addition, the dam delayed the creek's peak flow until the North Thames River in St. Marys began to drop. These actions helped to ensure that the North Thames River did not rise to the top of the St. Marys Floodwall in the downtown.

4. Why is there flooding in low-lying areas downstream?

Low lying areas next to a stream or river are called flood plains. These areas are a natural interface between water and land, whose natural functions are to convey and store water, thereby reducing and slowing downstream peak flows. Flood plains are part of the river system; water in these areas is natural and not considered problem flooding.

The key reason that Ontario's *Conservation Authorities Act* does not permit development in flood plains is to protect life and property. While activities such as recreation are generally permitted in the flood plain, when planning for the use of these areas it is important to understand that there will be interruptions to the activities when the river naturally overtops its banks.

The St. Marys Golf and Country Club (SMGCC) has expressed concerns that Trout Creek's streambanks are overtopped at 6 m^3/s. During recent rain events, SMGCC has also suggested that local drainage issues can result from flows above 2.5 m^3/s. Wildwood Dam was neither designed nor intended to prevent Trout Creek from utilizing its natural flood plain. The typical natural channel capacity for a watershed such as Trout Creek would be significantly greater than 20 m^3/s, with minor inundation of low lying flood plain areas. Flood control dams reduce the frequency and magnitude of floods, but they do not prevent all flooding downstream.

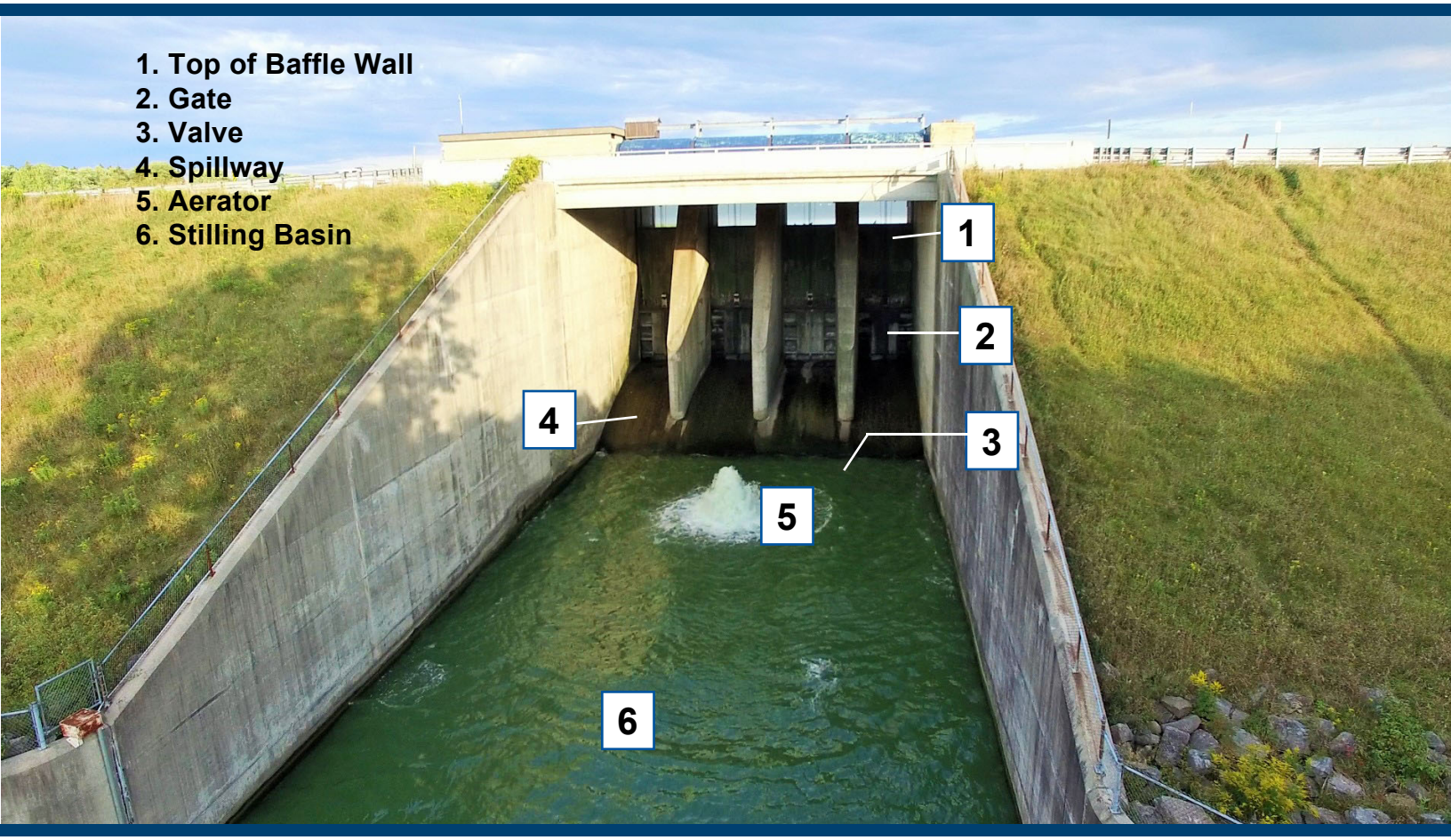
5. Is the reservoir completely filled during a flood to reduce downstream impacts?

The only way the reservoir could fill completely would be during an extreme runoff event, which has not occurred since the dam was constructed. At the summer conservation level (6.55 m), the reservoir is slightly more than 70% full, with an additional 6.3 million m^3 of flood storage. This level ensures there is sufficient water to supplement downstream flows throughout the drier summer months, while maintaining sufficient space to store runoff and manage flooding impacts downstream.

Wildwood Dam: Design

Wildwood Dam has baffle walls, 4 gates, 3 valves, a spillway, an aerator, and a stilling basin.

1. The concrete **baffle walls** are located above the gates. Water flows freely over the baffle walls when the reservoir is elevated during a flood event.
2. The 4 **gates** are raised or lowered to control the flow of water through the base of the dam. Each gate is 3.65 metres wide x 3.65 m tall.
3. The 3 underwater **valves** release water into Trout Creek to supplement flows downstream. Each valve is 42 cm in diameter.
4. The concrete **spillway** protects the dam from damage caused by the force of water flowing over it.
5. The **aerator** below the dam increases dissolved oxygen levels in Trout Creek to improve aquatic habitat.
6. The **stilling basin** is underwater at the end of the spillway. It spreads out the force of the water to protect the dam's foundation and prevent severe erosion downstream.



6. If the forecast is calling for rain, can water be released from Wildwood Reservoir to make more space for runoff?

Weather forecasts are an important source of information in making operational decisions at Wildwood Dam. However, in the late spring/early summer, increasing discharge from the reservoir based on weather forecasts is not wise, because of the very real risk of not being able to refill the reservoir back to the target summer conservation level.

Rain forecasts, even with 100% probability of precipitation, are rarely accurate for location, amount, and intensity/duration, all of which affect runoff. If water that was stored in the reservoir to augment downstream flows were released pre-emptively, significant runoff would be needed to get the reservoir back up again. If such runoff is not received, the result would be insufficient water in the reservoir to supplement flows downstream, affecting water quality and aquatic habitat in Trout Creek and the North Thames River.

7. Can the reservoir's target "summer conservation level" and "winter holding level" be lower so that there's more room to store flood waters?

Modifying the summer and winter reservoir operational levels would have major consequences. Lowering the summer conservation level would:

- Reduce the amount of water available for flow augmentation in the drier summer months, increasing the risk of not having enough water to supplement downstream flows (supplementing flows supports water quality, aquatic habitat, and human uses such as irrigation),
- Lower the water level for recreational activities on the reservoir (e.g., cottagers, boaters, sailing club, etc.), and shorten the season in which the reservoir can be safely used for recreational activities (boating is not safe if water is too low).

Lowering the winter holding level would reduce critical winter habitat for aquatic species. Because of these kinds of major impacts, any change to reservoir target levels would likely require a detailed assessment and public consultation process (i.e., an Environmental Assessment).

8. Are there ways to mitigate the downstream impacts of high water?

Wildwood Dam mitigates downstream impacts of high water by significantly reducing the frequency and magnitude of high water events. The St. Marys Floodwall provides significant flood protection to the historic downtown area of St. Marys.

A 550 metre long floodwall, constructed in 1990 where Trout Creek (middle left) enters the North Thames River (lower left to middle right), protects historic downtown St. Marys from flooding up to the floodwall's designed level of protection (100 year flood).

For others that may be located in a flood plain area, there are various actions that may be feasible to reduce the impacts of high water:

- Look at floodproofing opportunities to reduce vulnerability to flooding (i.e., protect critical vulnerable infrastructure),
- Consider flood resiliency opportunities to return back to normal more quickly after high water events (e.g., improved drainage),
- Look at flood conveyance opportunities (e.g., identify and reduce downstream flow constrictions/restrictions),
- Modify land uses (i.e., move vulnerable activities out of the flood plain).

As previously stated, the key reason that Ontario's *Conservation Authorities Act* limits new development in flood plains is to protect life and property from the impacts of high water.

9. Has anything changed since 2012?

Since Wildwood Dam was designed and constructed, the information our engineers use to make operating decisions has improved. From time to time, dam operations have been fine tuned in response to this new information.

The website graphic representing the dam's "operating curve" has been updated to better represent how the structure is operated, but the actual operational targets and objectives are unchanged.

It is critical that the reservoir reach the summer conservation level in the spring, in order to meet the minimum target discharge in the summer and fall.

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For More Information

http://thamesriver.on.ca/water-management/flood-control-structures/wildwood-dam/
http://thamesriver.on.ca/wp-content/uploads//FloodStructures/2018Feb-FloodReview.pdf