



2023 Flood Contingency Plan



Prepared for: Municipalities and other partners/agencies in the Rideau Valley Watershed

Prepared by: Brian Stratton, P. Eng., RVCA Flood Forecasting and Warning Coordinator

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1.0 Introduction

The Rideau Valley Conservation Authority (RVCA) 2023 Flood Contingency Plan was prepared in accordance with the provincial standards established in the *Ontario Flood Forecasting and Warning: Implementation Guidelines for Conservation Authorities and Ministry of Natural Resources and Forestry's* document.

The responsibility for dealing with flood contingency planning in Ontario is shared by municipalities, Conservation Authorities (CAs) and the Ministry of Natural Resources and Forestry (MNR), on behalf of the province.

The purpose of this manual is to provide an overview of how RVCA Flood Forecasting and Warning System operates. Key information presented in this manual includes:

- roles and responsibilities throughout a flood event
- key background information about water management in the RVCA
- RVCA flood forecasting and warning operations
- the RVCA flood message system

This manual is not a municipal emergency preparedness plan and should not be used for that purpose.

The goal of the RVCA Flood Forecasting and Warning System is to provide an estimate of the potential for river and stream flooding in the Rideau Valley watershed (see Figure 1) and, based on that estimate, give sufficient advance warning to the designated municipal officials and members of the public in order that appropriate steps can be taken to reduce the risk of loss of life, injury, and property damage due to flooding.

This plan will be revised, updated, and sent to the emergency contacts distribution list by RVCA, on an annual basis. The list includes emergency contacts from:

- Member Municipalities and Counties;
- MNR Surface Water Monitoring Centre;
- MNR Kemptville;
- MNR Provincial Response Centre;
- Emergency Management Ontario;
- Ontario Power Generation;
- Ontario Provincial Police;
- Ottawa River Regulation Planning Board;
- Nation Capital Commission; and
- Neighbouring Conservation Authorities.

2.0 Roles and Responsibilities

The following is a summary of the roles of the RVCA, property owners, municipalities, provincial government, and others in the response to a flood emergency:

2.1 The Rideau Valley Conservation Authority:

The RVCA will develop and maintain a Flood Forecasting and Warning System. To implement its responsibilities, RVCA will:

- maintain a local network and carry out data collection
- assist MNRF in the delivery of flood forecasting and warning
- assess local conditions and forecast the response of rivers and streams
- receive early flood messages from MNRF's Surface Water Monitoring Center (SWMC)
- access MNRF's weather forecast and snow course data
- issue flood warning messages to watershed landowners and municipalities, MNRF and SWMC as conditions dictate
- provide local flood message information to MNRF District and the SWMC

The Conservation Authority's mandate includes Flood Forecasting and Warning only as summarized above. The RVCA's role in flood combat is limited to ensuring that Authority properties are secure and that Authority water control structures are operated to minimize the impact of high flows.

2.2 Property Owner:

Each property owner in a flood vulnerable area (low area along water body):

- is advised to be aware of the flood potential and have a flood contingency plan for minimizing the impact of flood waters (e.g. backup sump pump, generator, sandbags and sand and deployment plan)
- may contact municipality for assistance if extent of flooding exceeds their ability to respond

2.3 Municipality:

To implement its responsibilities related to potential flood emergencies, each municipality will:

- prepare and maintain an Emergency Plan which shall have a section with details of personnel duties, the municipal equipment inventory and the deployment of both in the event of an emergency. The Municipal Emergency Plan can incorporate the RVCA's Flood Forecasting and Warning Plan
- in the event of a flood beyond the individual property owners' abilities to combat, the Reeve/Mayor may invoke the Municipal Emergency Plan and the municipality may provide a response to the flood threat
- contact Emergency Management Ontario (EMO; 1-866-314-0472 or 1-416-314-0472) to engage Provincial assistance if the degree of flooding exceeds the municipal capabilities. This will be done in accordance with the Municipal Emergency Plan

2.4 Provincial Government:

Ministry of Community Safety and Correctional Services, OFFICE OF THE FIRE MARSHALL AND EMERGENCY MANAGEMENT (Emergency Management Ontario (EMO)):

- receives municipal requests for assistance and coordinates the provincial response by assigning responsibility for the emergency to the appropriate Ministry; provides support throughout the event

Ministry of Natural Resources and Forestry (MNRF):

MNRF - Surface Water Monitoring Centre:

- maintains and makes available an information system to Conservation Authorities, MNRF District offices where Conservation Authorities do not exist and any agencies responsible for water control structures (e.g. Ontario Power Generation) to provide weather, river flow and snow cover data
- provides interpretation of climatic conditions on a provincial scale and issues Provincial Flood messages to Conservation Authorities and other agencies in affected areas

MNRF - Provincial Emergency Response Coordinator:

- prepares and administers a Provincial Flood Emergency Plan which includes authorization and support for action at field level from other ministries (Environment and Climate Change, Health, Community Safety and Correctional Services, Transportation)
- assesses the situation on receipt of a request for Provincial assistance via Emergency Management Ontario and works with District staff to determine resource requirements to assist municipal efforts
- if necessary, recommends to the Provincial Cabinet that an emergency ought to be declared

MNRF - District:

- once a local emergency is declared, the MNRF District Emergency Plan may be invoked, and resources committed as deemed appropriate
- District staff can work directly to assist the municipality in consultation with the local Conservation Authority

2.5 Other Agencies:

Parks Canada - Ontario Waterways:

- operates the Rideau Canal in the non-navigation period to provide flood storage by drawing down the water level each fall and flood level reduction by manipulation of the dams to allow the passage of river flows in as controlled a manner as possible throughout the spring freshet and other high water periods
- operates and provides access to RVCA to stream gauges on the system

City of Ottawa:

- removes the ice cover each spring from the Rideau River between Rideau Falls and the George Dunbar Bridge (Bronson Avenue) to reduce the risk of ice-jam related flooding
- provides assistance to residents as needed as do other municipalities.

Ottawa River Regulation Planning Board (ORRPB)

- established to ensure integrated management of the principal reservoirs of the Ottawa River Basin
- goal of this integrated management is to provide protection against flooding and maintain the interests of the various users, particularly in hydro-electric energy production.
- Ottawa River Regulating Committee (ORRC) conducts the main operations for the ORRPB and is made up of agencies that make the day-to-day decisions about the management of the reservoirs with the Ottawa River Basin
- ORRC uses real-time data of water levels and flows collected throughout the basin as well as snow monitoring data and weather forecast data to develop river conditions forecasts such as water levels and flows along the main stem of the Ottawa River
- The Ottawa River Regulation Secretariat (ORRS) is the executive unit for the ORRPB and supports the work of the ORRC.

To obtain water level and flow data and river condition forecasts, please visit the Ottawa River Regulation Planning Board website: <http://www.ottawariver.ca/river-levels-flows.php>

3.0 Flooding in the RVCA Jurisdiction

The Rideau Valley watershed is 4,234 km² in size and is shown on Figure 1. The Rideau River extends from Burridge Lake, located just west of Westport, for 160 km to Rideau Falls in downtown Ottawa where it discharges into the Ottawa River. The main tributaries on the Rideau River include the Tay River, Jock River, and Kemptville Creek. There are also many smaller tributaries that drain into the Rideau River. Dams on lakes and rivers operated or owned by the RVCA, Parks Canada, MNRF, and power generation companies control flow. There are approximately 46 control structures in the Rideau River watershed including 24 dams, 19 locks (on the Rideau Canal), and three power generating stations. These structures can have a significant effect on surface water flows.

3.1 Lakes and Reservoirs

The upper portion of the Rideau Valley watershed contains many lakes that, when considered together, represent a significant capacity for surface water storage. Bobs, Crow, and Wolfe Lakes are known as 'Reservoir Lakes' and are shown on Figure 1. Lower Rideau, Big Rideau and Upper Rideau Lakes are known as 'Navigational/Drawdown Lakes' and are also shown on Figure 1. The Reservoir and Navigational/Drawdown Lakes are used to store water in the upper watershed during the spring, and the water is then released between June and October to help augment flows in the lower watershed. Navigation lakes differ from reservoir lakes because of the need to maintain their water levels within specific bounds during the navigation season. Christie Lake is located just downstream of Bobs Lake and it's referred to as a 'flow-through lake' because the water levels in Christie Lake are dependent on water flowing from Bobs Lake.

Each year, water is released from Big Rideau Lake in support of the City of Ottawa ice management program in the prefreshet period to the greatest extent possible.

Parks Canada springtime operations are aimed at filling each lake to its rule curve level by the end of the spring freshet period, while preventing local flooding around each lake and excessively high outflows. The current lake filling target is the start of navigation season on May 15 each year. The lakes are held as near their 'full levels' as possible during the summer while satisfying downstream flow requirements. These demands and evaporative losses result in gradual drawdown through the summer period. The lakes are then brought down to their winter holding patterns after the navigation season.

3.2 Rideau River Downstream of the Poonamalie Lock Station

Downstream of the Poonamalie Lock Station, the channel reach sections of the Rideau River are regulated to maintain levels in the required navigation range throughout the navigation season. In the non-navigation season, the individual reaches are lowered to winter holding levels which are based on experience and based on consultations with local fish and game clubs, trappers' associations and MNRF in order to reduce any impacts on the fisheries and fur bearing population.

The downstream control structures at Hogs Back and Black Rapids are normally stripped of stop logs through the winter. This practice allows for the passage of any unexpected or early snowmelt flood without the need to remove stop logs. The control structures for the longer reaches, for example at Long Island, Merrickville and Kilmarnock are operated through the winter to preserve the natural habitat along the river and in adjacent marshlands.

Water levels along the length of the river rise prior to the freshet as flow is released for the City of Ottawa ice management program. The freshet causes the level to rise a second time due to snowmelt and spring runoff. The reaches are not filled to the navigation levels until early in May.

3.3 Ottawa River Watershed

The Ottawa River watershed (see Figure 2) is 146,300 km² in size, which is twice the size of New Brunswick. The Rideau Valley watershed is only 2% of the size of the Ottawa River watershed. The limits of the Ottawa River which are within the RVCA jurisdiction are shown on Figure 1 and go from Watts Creek (west) through to the east boundary of Becketts creek watershed (east). The Ottawa River watershed extends from Lac des Outaouais, Quebec, located 250 km north of Ottawa and outlets into the St. Lawrence River in Montreal, Quebec. The Ottawa River watershed has 13 principal reservoirs that are used for a variety of purposes, including hydroelectric generation, flood reduction, and the release of water during winter months to help augment flows in the lower part of the watershed. Although the Ottawa River watershed contains several reservoirs which act to store water in the upper 40% of the watershed, 60% of the watershed is unregulated where dams are essentially 'run of the river' with no storage capacity during high flow events.

3.4 Causes of Flooding

Most flooding in the jurisdiction of the RVCA is a result of heavy continuous rainfall in combination with snow melt. Flooding on the Rideau River typically occurs in the spring between March 26th – April 12th with a median date of April 3rd as a result of a combination of snowmelt and precipitation runoff with about 48 hours from when flows begin to increase to flood peak.

Unexpected or unusual heavy rains which can potentially happen at any time of the year and cause flooding of small tributaries. For example, unprecedented rainfall in the Village of North Gower and across the Rideau valley watershed on July 24, 2017 caused floodwaters in some homes and streets in North Gower.

For the Ottawa River, high flows occur normally in the spring typically near the end of April as a result of large rainfall events in combination with snow melt within the large Ottawa River watershed. The peak flows from the numerous tributaries of the Ottawa River watershed occur at different times and therefore typically produce two distinct peak flow events in the Ottawa River, usually about three weeks apart. The first flood peak originates from unregulated flows from the southern tributaries and is typically the lesser of the two peaks but with ice present, flood damage can occur because of ice jams. The second peak is a result of a combination of high flows from the northern tributaries and headwater areas and is partially regulated by reservoir operations. Two very significant flood events occurred along the Ottawa River in 2017 and 2019.

3.5 Flood Vulnerable Areas

The areas at risk of being flooded up to the 1:100 year return frequency levels have been determined by RVCA floodplain mapping studies. These areas are referred to as RVCA Flood Vulnerable Areas and listed in Table 1 and shown on Figure 3. The RVCA flood prone vulnerable areas are mostly adjacent to the Rideau River (16 areas) as well as Kemptville Creek, the Jock River, Steven Creek/Taylor Drain, the

Tay River and Christie Lake, and the Ottawa River. On Table 1, some areas are referred to as 'Area of Reduced Flood Risk (RFR)' which means a flood control structure (such as a berm, wall or pathway) exists in this area to lower the risk of flooding. Also, on Table 1, it indicates the 'return period when residential dwellings start to become impacted' if this information is available. The return periods were calculated for each river or stream when the flood plain mapping studies were completed. The higher return periods equate to higher flow and are explained below:

- A 1:100 year return period means that there is a 1% chance of this flow occurring in any year
- A 1:50 year return period means that there is a 2% chance of this flow occurring in any year
- A 1:20 year return period means that there is a 5% chance of this flow occurring in any year
- A 1:10 year return period means that there is a 10% chance of this flow occurring in any year
- A 1:5 year return period means that there is a 20% chance of this flow occurring in any year
- A 1:2 year return period means that there is a 50% chance of this flow occurring in any year

Although not shown on Figure 3 or included on Table 1, other flood vulnerable areas include:

- tributaries to the Ottawa River lying between the east boundary of the watershed of Watts Creek on the west and the east boundary of the watershed of Becketts Creek on the east (Stillwater, Graham, Pinecrest, Green, Bilberry, Taylor, Cardinal and Becketts Creeks)
- minor tributaries of the Rideau River (Sawmill, Nepean, Black Rapids, Mosquito and Mud Creeks).

These systems will have increased flows as a result of spring snowmelt and rainfall runoff but are also susceptible to heavy localized rainstorms at any time of the year. Capital projects on Graham, Stillwater, Bilberry and Sawmill Creeks have been undertaken to minimize the flood risk and/or bank instability resulting from flood flows. New development on these and other watercourses is being done with stormwater management, flood protection and geotechnical considerations incorporated into the design because weather forecasting cannot be sufficiently precise to allow accurate and timely flood warnings for these systems that react rapidly to very localized rainfall events (thunderstorms). Therefore, the Authority does not provide flood forecasts or warnings specifically for these watersheds. If heavy rainfall is forecast, residents in susceptible areas should take precautions.

Forecasts and warnings apply to the flood vulnerable areas discussed above and generally to any low-lying area adjacent to waterbodies.

4.0 RVCA Flood Forecasting and Warning Operations

RVCA staff apply the Daily Planning Cycle (DPC) to determine what changes to water level and flow conditions can be expected each day throughout the year. The DPC is a computer-based tool that brings all the pertinent data into one place automatically. The data are assessed with the application of spreadsheet-based models. The results are then incorporated into a Watershed Statement, if needed, that is issued to partners and the public.

4.1 Data Collection Network

Snow Measurements - The Authority monitors six snow course locations in the lower watershed (downstream of Lower Rideau Lake) on which flow forecasts are based. In addition, Parks Canada measures snow cover in the upper watershed on which flow estimates for the Tay system and inflow to the Rideau Lakes are based. From the snow measurements, the water equivalent is calculated, and from that, an estimate is made of the depth of water lying on the watershed available to run off to the waterways.

Weather Data – Precipitation, temperature and other weather data are acquired from the websites of the Meteorological Services of Canada (a division of Environment and Climate Change Canada), the Weather Office of the Aviation and Forest Fire Management Branch of MNRF, AccuWeather and The Weather Network.

Water Levels/Streamflow - There are seventeen water level and/or streamflow monitoring stations owned and/or operated by a variety of agencies (Water Survey of Canada (a division of Environment and Climate Change Canada), Parks Canada, MNRF and RVCA) available to the Authority. These gauges are polled daily through the year to monitor conditions in the Rideau system. The data is used in various Authority programs but, primarily, it is the basis for RVCA Flood Forecasting and Warning.

4.2 Operations Centre / Contact List

All Flood Forecasting and Warning activities are coordinated from the Rideau Valley Conservation Centre (RVCC) at 3889 Rideau Valley Drive. RVCA's contact list for Flood Forecasting and Warning can be found in Appendix 1, along with local contacts for MNRF and the Ministry of Community Service and Correctional Services, Emergency Management Ontario.

4.3 On-going Review of Ottawa River Conditions

RVCA staff conduct on-going monitoring of Ottawa River flood conditions throughout the year, especially during the months of April and May. Key tasks include:

- On-going review of water levels, flows, weather forecasts for Ottawa River Basin. See <https://ottawariver.ca/> for Current Conditions Summary and River Conditions Forecast.
- On-going / regular contact with Ottawa River Regulation Secretariat (Manon Lalonde and Michael Sarich).
- Review of Ottawa River Regulation Planning Board (ORRBP) Press Releases and Bulletins.
- Review of Ottawa River Regulation Committee (ORRC) model results (not to be provided to municipal staff or members of the public).
- Review of ORRC Peak level Forecasts (only available for significant flood events).

4.3.1 Lower Ottawa River Early Flood Warning Group

In 2019, Mississippi Valley Conservation Authority, RVCA, South Nation Conservation, Ottawa River Regulation Planning Board, Ministry of Natural Resources and Forestry (MNR) District Office and MNR's Surface Water Monitoring Centre agreed to the formation of a **Lower Ottawa River Early Flood Warning Group** to address flood conditions along the Ottawa River from Arnprior eastward to the Carillon Dam (referred to as the Lower Ottawa River).

The main mandate of this group is to enhance and ensure consistent flood assessment and warning along the Ottawa River from east of Arnprior to the Carillon Dam. The group meets periodically outside of the flood season and more regularly during any high events on the Ottawa River.





4.4 Communications


The RVCA Flood Forecasting and Warning Coordinator is responsible for the operation of the Flood Forecasting and Warning System and responds to routine information requests from other agencies, the public and the media. During a significant flood event, incoming telephone calls will be taken by specifically assigned staff who will provide basic information. Requests for more detailed information or media interviews will be coordinated by the Director of Communications and forwarded to the contact person for that day. Flow information updated on a daily basis is available year-round on the Conservation Authority webpage (<https://www.rvca.ca/watershed-monitoring-reporting/reporting/streamflow-water-levels#streamflow>). All flood related statements are emailed to an extensive list of stakeholders, landowners and medial contact, and also posted on the webpage and on Facebook and Twitter. Also, a recorded message is accessible on the Authority telephone system (692- 3571 or 800-267- 3504, extension 1164.)

4.5 Flood Messages

Flood statements will be issued by e-mail to municipalities, area residents, print and electronic media, MNRF offices, Parks Canada and to other agencies. **The RVCA will issue flood related statements at any time circumstances dictate. Generally, however, statements will be issued before noon so that there will be sufficient time for recipients to initiate their response during the day.**

All the messages are **Watershed Conditions Statements** and come in the following types:

<p>NORMAL is when no flooding presently occurring anywhere in the watershed.</p>	
<p>1a. WATER SAFETY is issued to warn the public of unsafe conditions around waterbodies at any time of the year such as unstable ice sheets or a rain event that could raise water levels quickly and make streambanks slippery.</p>	
<p>1b. FLOOD OUTLOOK is intended to advise municipalities and the public that conditions over the next five days could bring on flooding. This type of statement will be issued at any time through the year when weather forecasts of rain, melting and/or frazil ice accumulation that could cause the water surface elevation to exceed the bank full threshold above which overland flows begin in the Rideau River system. This will be to make the public and government officials aware of the situation in the watershed and to give them time to review contingency plans and make initial preparations.</p> <p>There will be a FLOOD OUTLOOK statement issued annually on or about March 1 regarding general flow and snowpack conditions at that time. That statement may include comments on other conditions such as ice-jam potential and safety issues related to the flow event.</p>	
<p>2. FLOOD WATCH is published if it is determined that surface water levels could surpass the threshold water level above which there is perceived to be a risk of damage to buildings and or contents and/or above which the residents' access to/from their homes is compromised within the next 72 hour period, a FLOOD WATCH statement will be issued to municipalities with flood susceptible areas, MNRF and Parks Canada offices, electronic media and newspapers by e-mail.</p>	
<p>Municipal and individual resident preparations should be completed.</p>	

<p>3.FLOOD WARNING - If it is determined that surface water levels will surpass the threshold water level above which there is perceived to be a risk of damage to buildings and or contents and/or above which the residents' access to/from their homes is compromised, a FLOOD WARNING statement will be issued at least 24 hours prior to the onset of flooding (rather than 24 hours prior to the forecast peak flow) to municipalities with flood susceptible areas by e-mail. MNRF and Parks Canada offices, electronic media and daily newspapers will receive the statement by e-mail addressed to the designated contacts (if applicable). If messages are not received, RVCA staff will phone relevant contacts to ensure the information is received. Municipalities will need to be ready to implement their Emergency Plans. The MNRF District office should be prepared to deploy resources as required and Rideau Canal operations should be on an emergency basis. All media agencies are expected to broadcast or publish the statement immediately.</p>	 <p>The graphic consists of four colored rectangular bars in a row: green, yellow, orange, and red. Above the red bar is a red callout box with a white downward-pointing arrow and the text "Flood Warning".</p>
<p>3a. UPDATE - FLOOD WATCH and FLOOD WARNING UPDATE statements will be issued every 24 hours or more frequently as conditions dictate. The updates will continue to be issued by e-mail to municipalities where flooding is occurring as well as MNRF and Parks Canada offices and media with a final termination statement to advise that flood waters are receding, and the flood emergency is over.</p>	

4.6 Ottawa River Flood Messages

As indicated in Section 4.3 above, RVCA staff are part of the Lower Ottawa River Early Flood Warning Group. When required, the group develops consistent flood messages for the Ottawa River.

4.7 2023 Distribution List for Messages

Appendix 2 provides a full list of names and emails for all municipalities and partners/agencies that are on the RVCA flood message distribution list for the current year.

Figure 1: Rideau Valley Watershed

Parks Canada Operation Summary

- Fall: Water levels in lakes and river are lowered
- Winter: Water levels adjusted up or down based on snow depth
- Spring: Lakes are filled. Multiple dam operations completed to mitigate flooding
- Summer: Maintain 'navigation' water levels

Legend

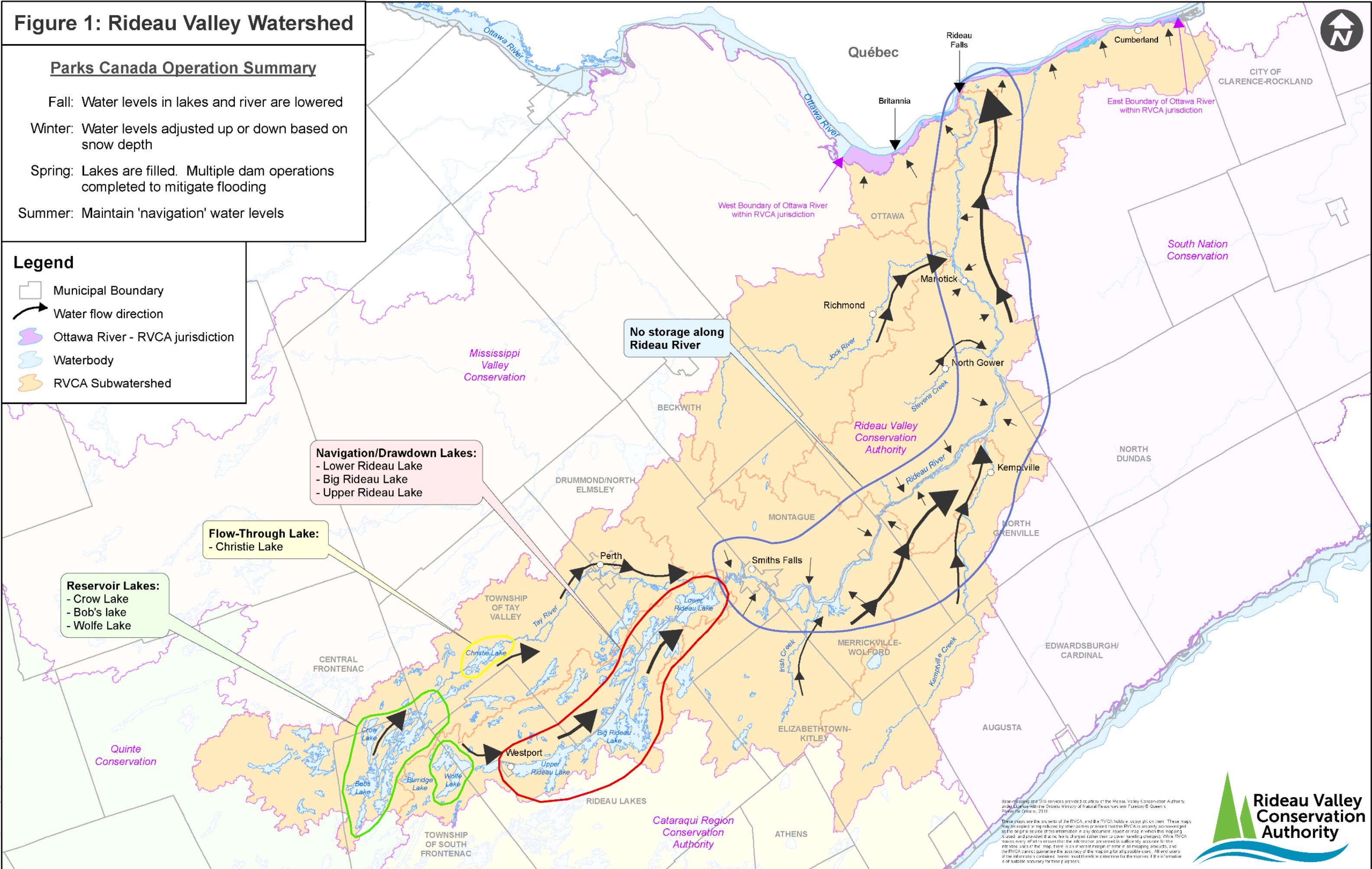
- Municipal Boundary
- Water flow direction
- Ottawa River - RVCA jurisdiction
- Waterbody
- RVCA Subwatershed

Navigation/Drawdown Lakes:
 - Lower Rideau Lake
 - Big Rideau Lake
 - Upper Rideau Lake

Flow-Through Lake:
 - Christie Lake

Reservoir Lakes:
 - Crow Lake
 - Bob's lake
 - Wolfe Lake

No storage along Rideau River



Base mapping and GIS services provided courtesy of the Rideau Valley Conservation Authority, and the Ontario Ministry of Natural Resources and Forestry © Queen's University, Ontario, 2018.

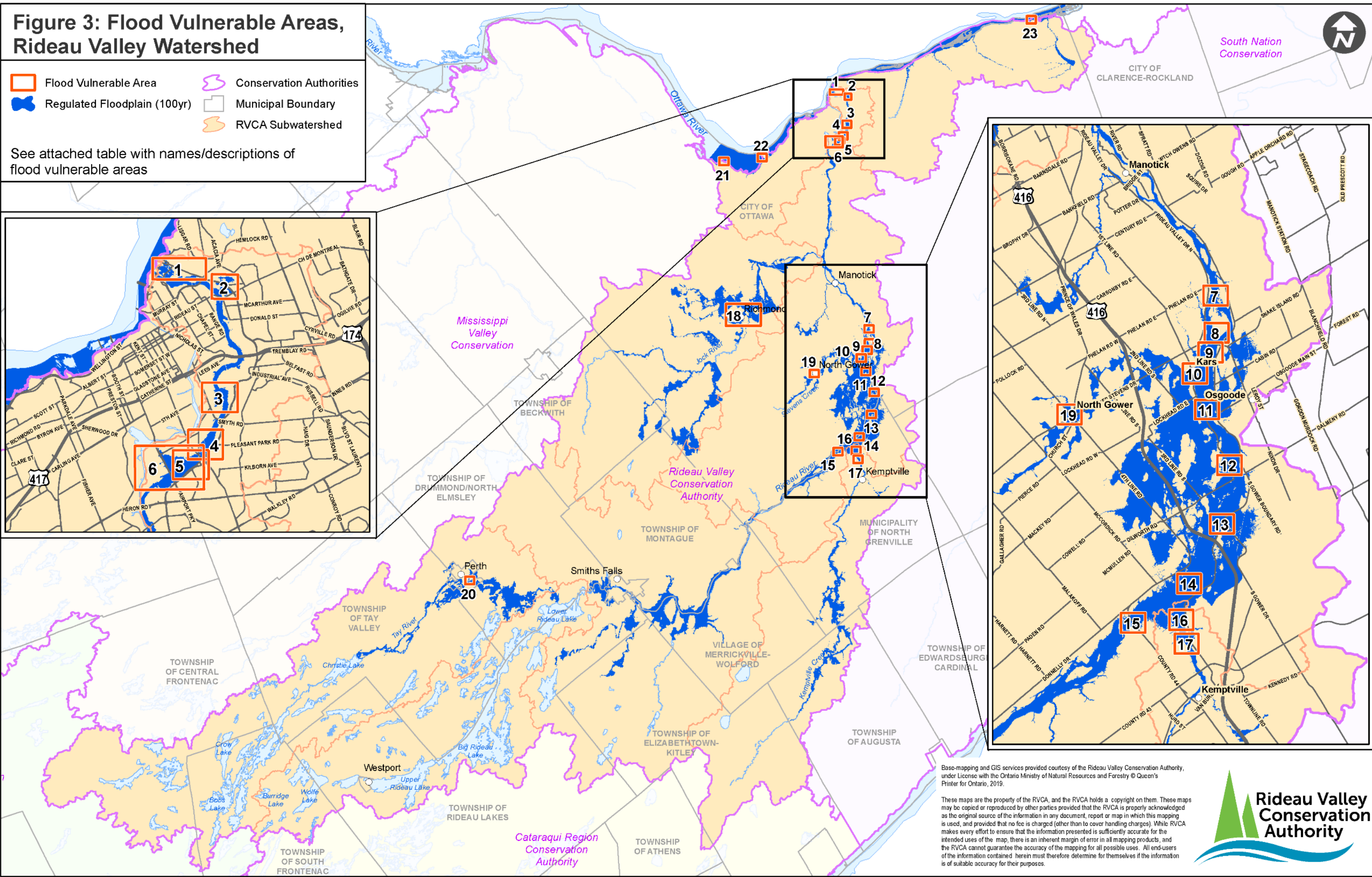
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Figure 3: Flood Vulnerable Areas, Rideau Valley Watershed

- Flood Vulnerable Area
- Conservation Authorities
- Regulated Floodplain (100yr)
- Municipal Boundary
- RVCA Subwatershed

See attached table with names/descriptions of flood vulnerable areas



South Nation Conservation

CITY OF CLARENCE-ROCKLAND

CITY OF OTTAWA

Mississippi Valley Conservation

Rideau Valley Conservation Authority

Cataraqui Region Conservation Authority

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Table 1
RVCA Flood Vulnerable Areas

Location on Map	River / Stream	Area of Reduced Flood Risk (RFR)	Description of Area	Return Period when Residential Dwellings start to become impacted
1	Rideau River		New Edinburgh	<ul style="list-style-type: none"> ○ 20 year return period for most of area ○ 10 year return period for houses on west side of Crichton St, near St Patrick St Bridge
2		Area of RFR due to presence of NCC pathway known as North River Road	Kingsview Park / Vanier Parkway / Landry Street	<ul style="list-style-type: none"> ○ Between 50 and 100 year return period
3			Brantwood Park / Onslow Crescent	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
4a			Rideau Gardens	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
4b		Area of RFR due to Windsor Park Dyke	Windsor Ave	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
5			Warrington Drive / Rideau River Lane	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
6		Area of RFR due to Brewer Park Dyke and corrugated steel flood wall	Carleton University and Brewer Park	<ul style="list-style-type: none"> ○ Between 20 year return period
7			Summerside Drive / Aston Road	<ul style="list-style-type: none"> ○ 10 year return period
8			Carleton Golf / Lewis Way / Hurst Marina	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
9			Commodore Drive	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
10			Kars – Lorne Bridge Road	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
11			Fennel Lane	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
12			Rideau Valley Drive - Upstream of Kars	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
13			Lannin Lane – Sheppard Way	<ul style="list-style-type: none"> ○ Between 5 and 10 year return period
14			Fairmile – Hilly Lane	<ul style="list-style-type: none"> ○ Less than 2 year return period
15		Rideau Glen – Becketts Landing	<ul style="list-style-type: none"> ○ Approx. 2 year return period 	
			between Smiths Falls and Poonamalie Locks (Smiths Falls Swale)	<ul style="list-style-type: none"> ○ Info not available
16	Kemptonville Creek		Cedar Beach Road – County Road 17	<ul style="list-style-type: none"> ○ Info not available
17			Harris Road – Riverview Road	<ul style="list-style-type: none"> ○ Info not available
				areas upstream of the Village of Oxford Mills

Table 1
RVCA Flood Vulnerable Areas

Location on Map	River / Stream	Area of Reduced Flood Risk (RFR)	Description of Area	Return Period when Residential Dwellings start to become impacted
18	Jock River		Richmond – parts of the Village, including areas on the tributaries (Bypass Drain, Flowing Creek and Van Gaal Drain)	o Info not available
			- areas on the tributaries Monaghan and Smith Drains and Leamy Creek - in the vicinity of Twin Elm Bridge	o Info not available
19	Stevens Creek / Taylor Drain		North Gower – parts of the Village and areas downstream	o Info not available
20	Tay River		Perth – parts of the Town	o Info not available
			Port Elmsley, Areas between Perth and Glen Tay	o Info not available
21	Ottawa River		Grandview	o 10 year return period
22		Area of RFR due to presence of Britannia Berm	Britannia	o Info not available
23			Boise Village – Morin Road	o Between 5 and 10 year return period
	Christie Lake			o Info not available