Overview of RVCA Flood Forecasting and Warning & Hydrometric Monitoring Programs

Real-Time Water Quality Monitoring Workshop

St. John's, Newfoundland and Labrador

November 7 & 8, 2023

Outline of Presentation

1. What is RVCA?
2. RVCA Flood Forecasting and Warning Program
3. RVCA Hydrometric Monitoring Program

1. What is RVCA?

Rideau Valley Conservation Authority

Your Rideau Valley Conservation Authority

THE RVCA is one of 36 conservation authorities in Ontario working to manage local watersheds to protect people and property from natural hazards and conserve critical natural resources.

Since 1966, the RVCA has worked closely with its member municipalities, provincial and federal governments, local landowners, farmers, businesses and community groups to protect communities from natural hazards, guide sustainable development, improve water quality and connect people with nature.

The RVCA looks to build resilient communities in the face of climate change and population growth by promoting an integrated watershed approach — one that balances human, environmental and economic needs. Our success is based on partnerships that accomplish local initiatives at the watershed scale.

OUR VISION: A thriving watershed with clean abundant water, natural shorelines, rich forests and wetlands, diverse habitat and sustainable land use that is valued and protected by all.

OUR MISSION: To understand, manage, protect, restore and enhance the Rideau watershed through science, stewardship, education, policy and leadership.

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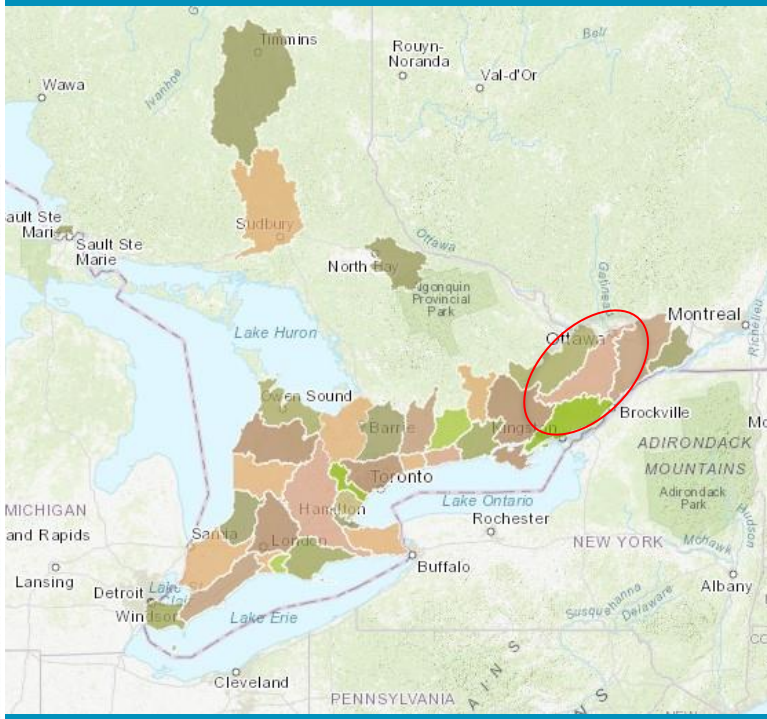
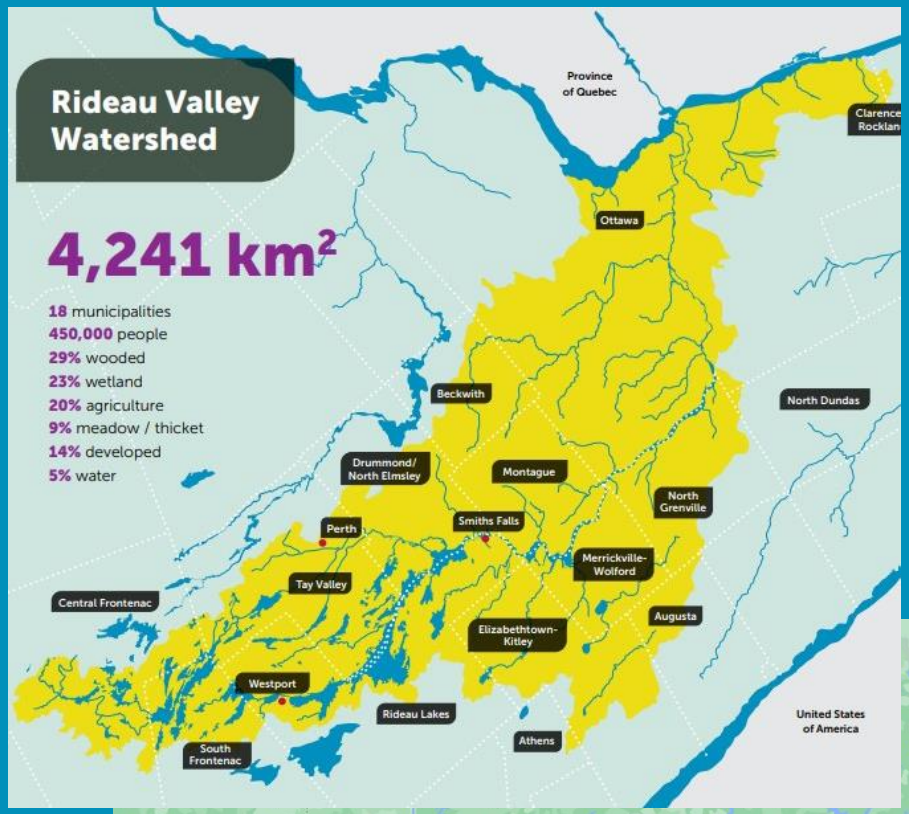
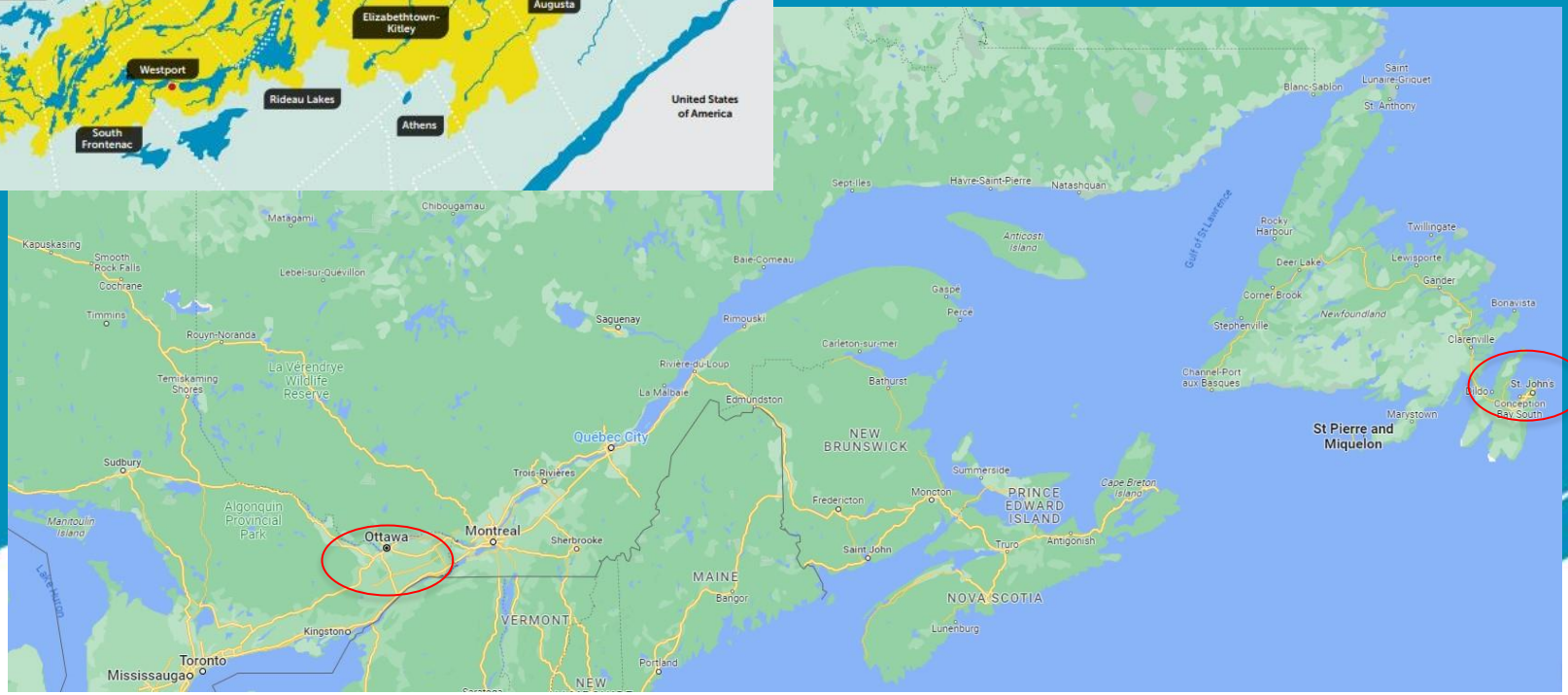
John McDougall	South Frontenac
Gene Richardson	Tay Valley
Robin Jones	Westport
Mel Foster	Agricultural Sector

The Rideau Valley watershed is located on the traditional unceded territory of the Algonquin Anishinaabeg people as well as the traditional territory of the Anishnabek, Huron-Wendat, Haudenosaunee and Oneida peoples. The RVCA pays respect to all Indigenous peoples in the watershed and acknowledges that they are the traditional guardians of this land and water. RVCA is working to deepen its understanding of local Indigenous peoples, cultures and knowledge and finding meaningful ways to collaborate and support reconciliation.



Rideau Valley Conservation Authority





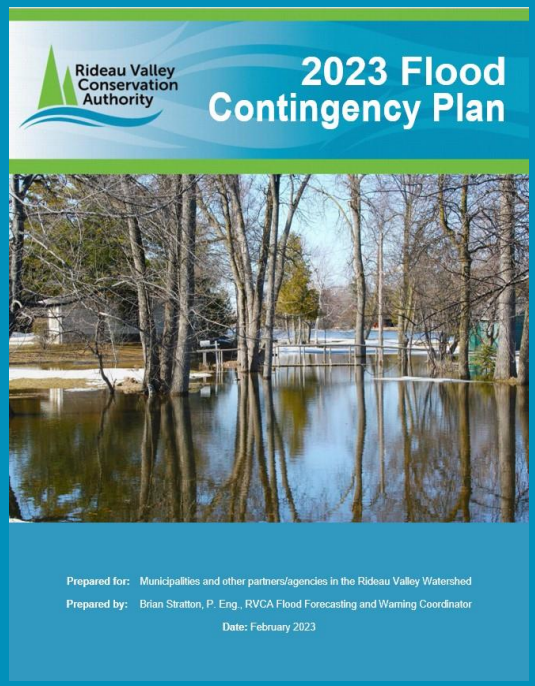
2. RVCA Flood Forecasting and Warning Program

Program Goal

The goal of the RVCA Flood Forecasting and Warning System is to:

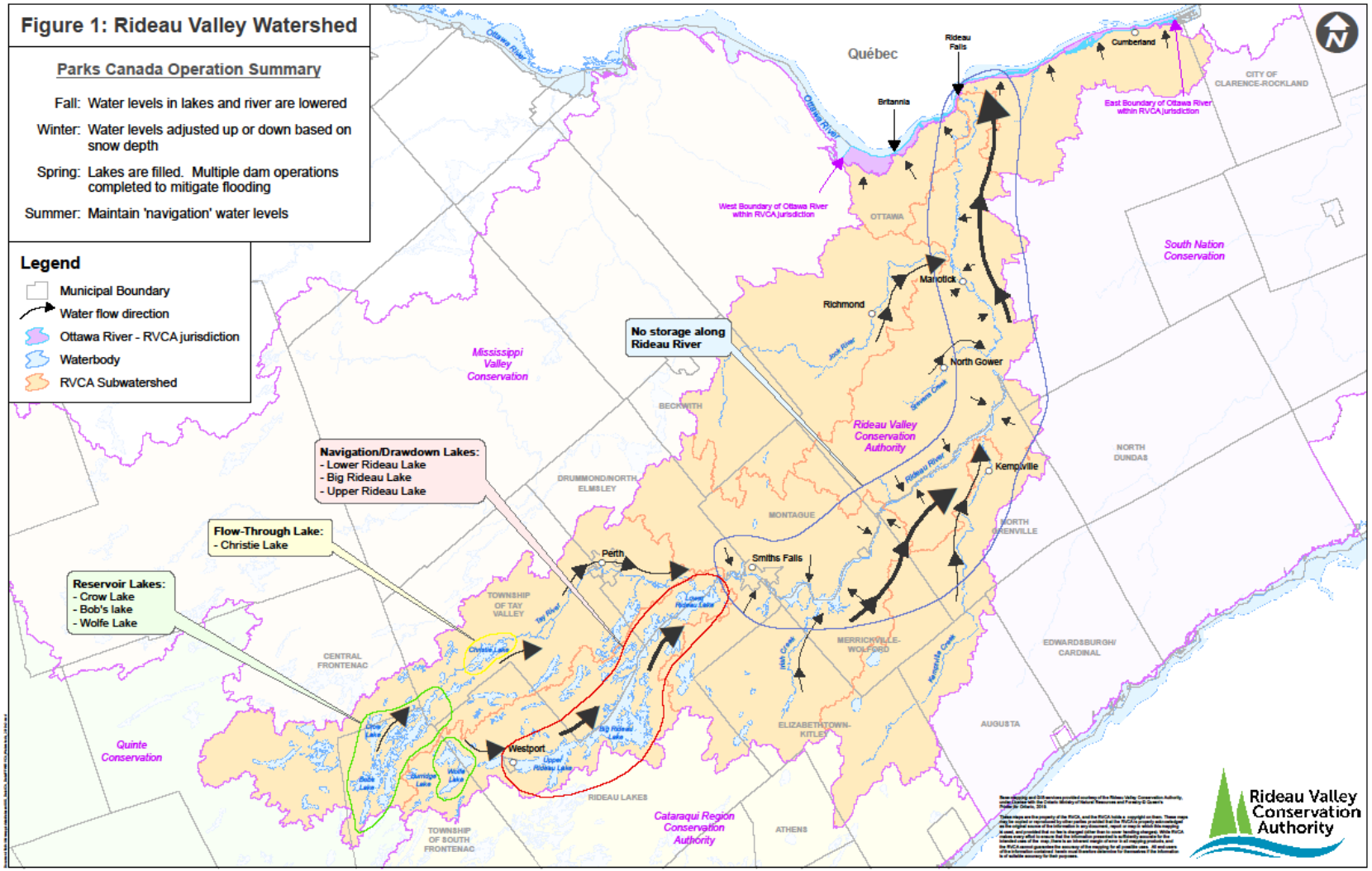
(i) provide an estimate of the flood potential in the Rideau River watershed, including the Ottawa River, at recognized "flood vulnerable centres" where flood conditions are relatively predictable and,

(ii) 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 minimize the effects of flooding.



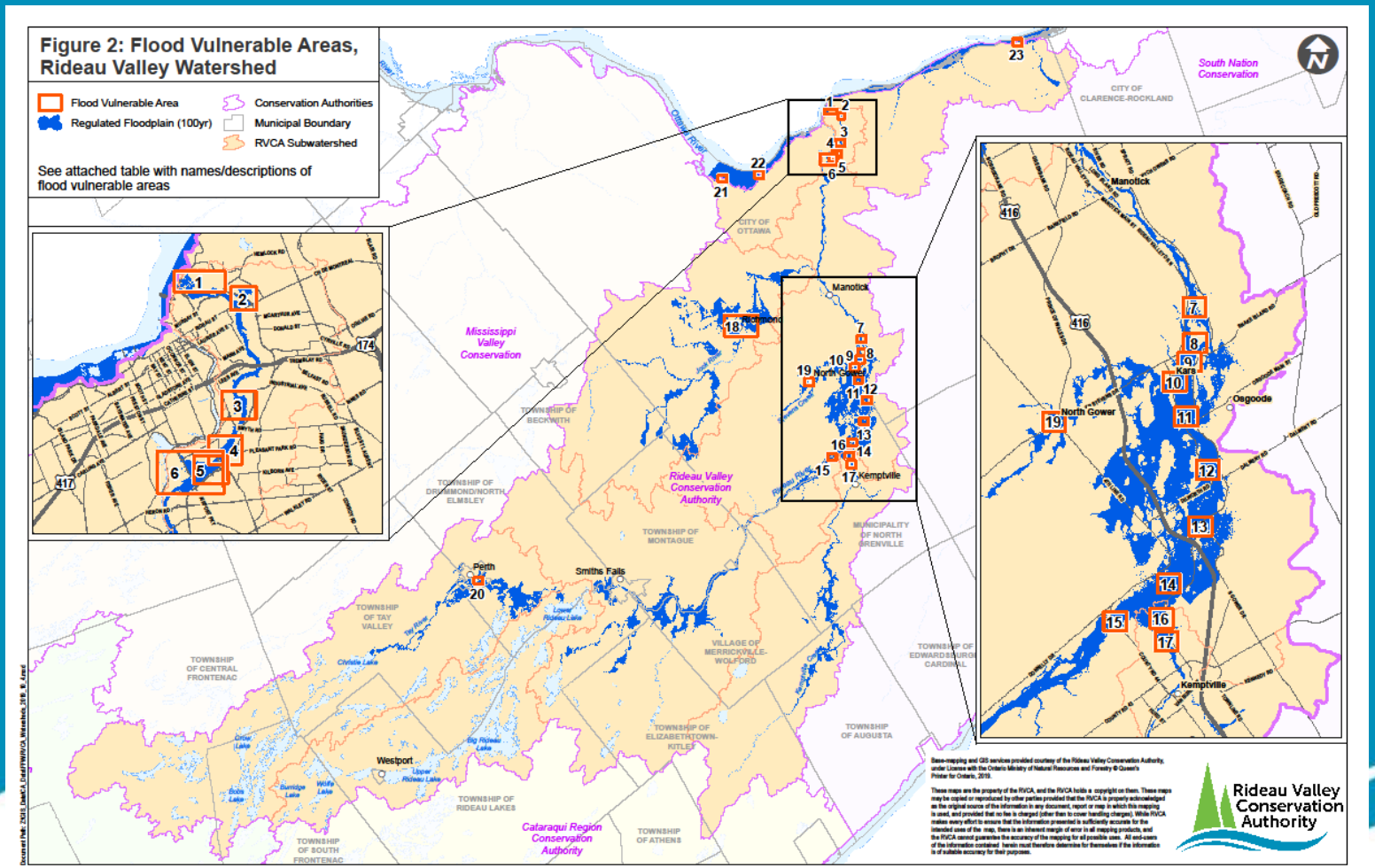
Watershed Flow Regime

Rideau Valley Conservation Authority



Flood Vulnerable Areas

Rideau Valley Conservation Authority



Key Program Components

Rideau Valley Conservation Authority

1. Data Collection
2. Flow and Water Level Prediction
3. On-going review of Ottawa River Conditions
4. Flood Documentation
5. Communications

Flood Terminology

Rideau Valley Conservation Authority

Flood Messages

Flood Warning & Flood Watch – Update #1: Water Levels To Remain High Across Rideau Valley

font size | Print | Email

(WCS - 06/2023)

April 8, 2023 – The Flood Warning and Flood Watch issued on April 6, 2023 remains in effect for the Rideau Valley watershed. Flood conditions are present in many low-lying areas adjacent to several rivers, lakes, creeks and ditches. Additional areas have the potential to flood next week, as the remaining snow within the City of Ottawa and the Tay River watershed is expected to finish melting due to multiple days with high temperatures in the double digits.

The short-term weather forecast indicates no precipitation for next few days. Staring on Monday April 10, 2023, temperatures will remain above zero all day with high temperatures in the double digits.

Based on the above, water levels and flows are generally expected to either remain elevated or increase in all waterways in the Rideau Valley Watershed throughout next week. Some specific areas of concern are highlighted below:

For more information, contact:
Brian Stratton
Manager, Engineering Services
613-692-3571 or 1-800-267-3504 ext. 1141
brian.stratton@rvca.ca

A **FLOOD WARNING** remains for the following areas:

- Properties around Bob's Lake, Christie Lake and Tay River in the upper Rideau Valley Watershed. Parks Canada staff are closely monitoring the water levels in Bobs Lake and Christie Lake, and operations at the Bolingbroke Dam will take place as required, to balance the levels in Bobs Lake and Christie Lake.
- Flooding impacts are occurring and expected to continue in the following areas:
  - Properties around the smaller creeks and streams in the lower Rideau Valley Watershed, including the low-lying roads and waterfront properties adjacent to Stevens Creek (near North Gower), and any connected creeks or ditches. Although water levels have receded, some risk of further increase exists with the remaining snowpack.
  - The Rideau River between Becketts Landing and Manotick, including Kemptville Creek. The water levels throughout this reach are expected to remain high for at least the next week.

A **FLOOD WATCH** remains for the following areas:

- Properties around Big Rideau Lake, Upper Rideau Lake, and along the Rideau River from Smiths Falls through Burritts Rapids.
- Low-lying properties (close to Rideau River) on Rideau River Lane and the community of Rideau Gardens. Water levels in this area will remain elevated for at least the next week and may increase somewhat as the snowmelt continues upstream.

Flood Messages

Rideau Valley Conservation Authority

Flood Warning Update #14 - OTTAWA RIVER – ARNPRIOR TO HAWKESBURY

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MAY 28, 2019 – Rideau Valley Conservation Authority (RVCA), in conjunction with the Mississippi Valley Conservation Authority (MVCA) and South Nation Conservation (SNC) is maintaining the **FLOOD WARNING** issued on April 19, 2019 for the areas under our jurisdiction along the Ottawa River.

Water conditions along the lower Ottawa River from Arnprior to Gatineau have been slowly declining but will remain well above normal conditions for this time of year. Levels from Gatineau to Hawkesbury are expected to remain stable and should resume declining on Wednesday. No additional increase in water levels is expected for this area.

Residents are strongly urged to keep sandbags in place for now. Updates to all projections will be provided as they become available.

Residents are advised to stay away from watercourses where flows are high and where banks might be unstable. Parents are encouraged to explain dangers to children.

For more information, contact:

Brian Stratton
RVCA Manager Engineering Services
613-692-3571 or 1-800-267-3504 ext. 1141
613-799-9423 (cell)
brian.stratton@rvca.ca

This **FLOOD WARNING** is in effect until Tuesday, June 4, 2019 at 5:00 PM.

RVCA and its Ottawa partners, MVCA and SNC monitor the water levels and weather forecasts with the Ministry of Natural Resources and Forestry as part of the Flood Forecasting and Warning Program. Updates are provided as conditions change.

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The Ottawa River Regulation Planning Board will be reassessing forecast conditions and providing hydrological condition updates on its website daily at www.ottawariver.ca/forecast.php.

Flood Contingency Plan

Rideau Valley Conservation Authority

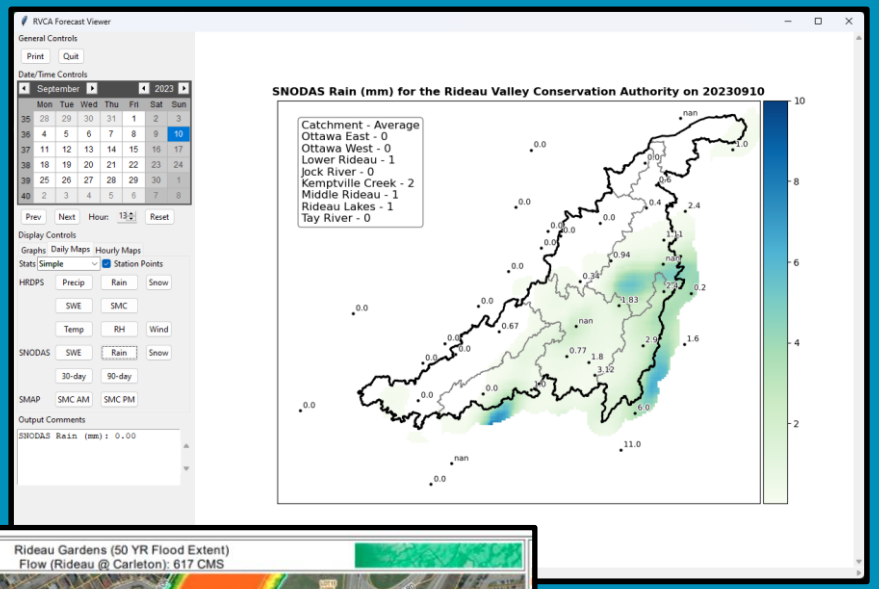
To learn more:

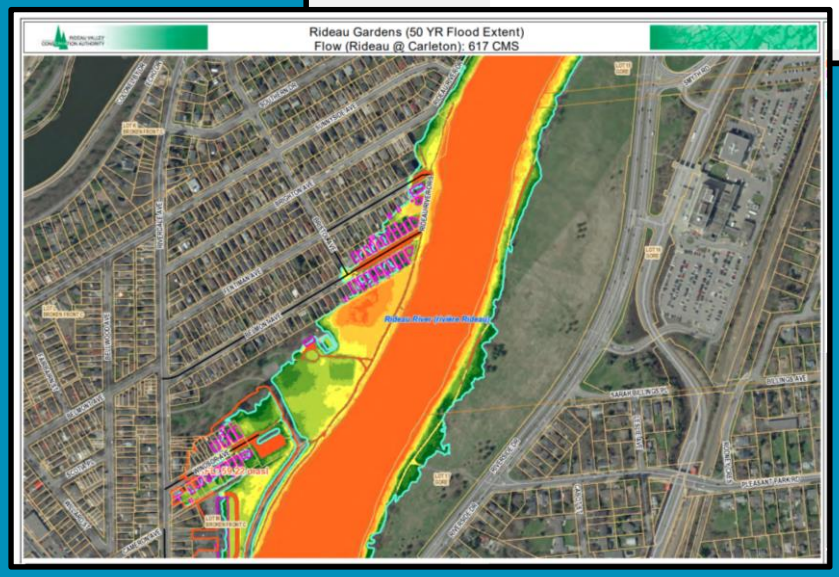
www.rvca.ca/watershed-conditions/flood-contingency-plan

New Developments

Rideau Valley Conservation Authority

- HEC-HMS / RTS flood forecast model in development
- Active integration of ECCC & NOAA gridded datasets
- Real-time flood inundation mapping
- Simulation of future climate change conditions





3. RVCA Hydrometric Monitoring Program

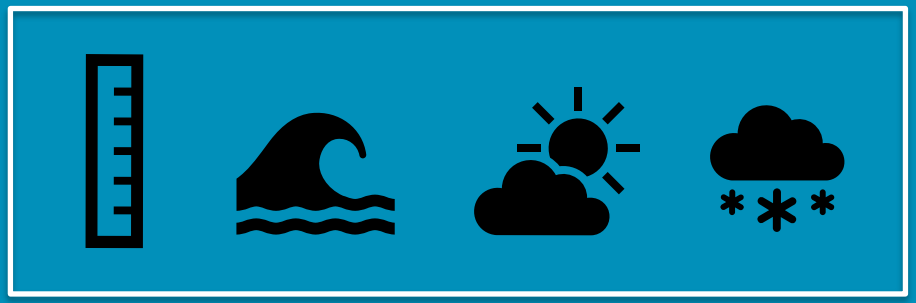
RVCA Real-Time Parameters & Data Types

1) Water levels

2) Stream flows

3) Weather (Observed & Forecast)

4) Snow pack



RVCA Hydrometric Monitoring Network

Partners:

- Water Survey of Canada
- Parks Canada
- Environment & Climate Change Canada
- Ministry of Natural Resources & Forestry

Ontario
Ministry of Natural Resources and Forestry
Parks Canada Parcs Canada
Environment and Climate Change Canada
Environnement et Changement climatique Canada
Water Survey Relevés hydrologiques

Active Real-Time Network:

- 25 water level stations (9 with computed stream flow)
- 15 weather stations
- 6 snow monitoring sites
- 3 GMON SWE stations (PC)

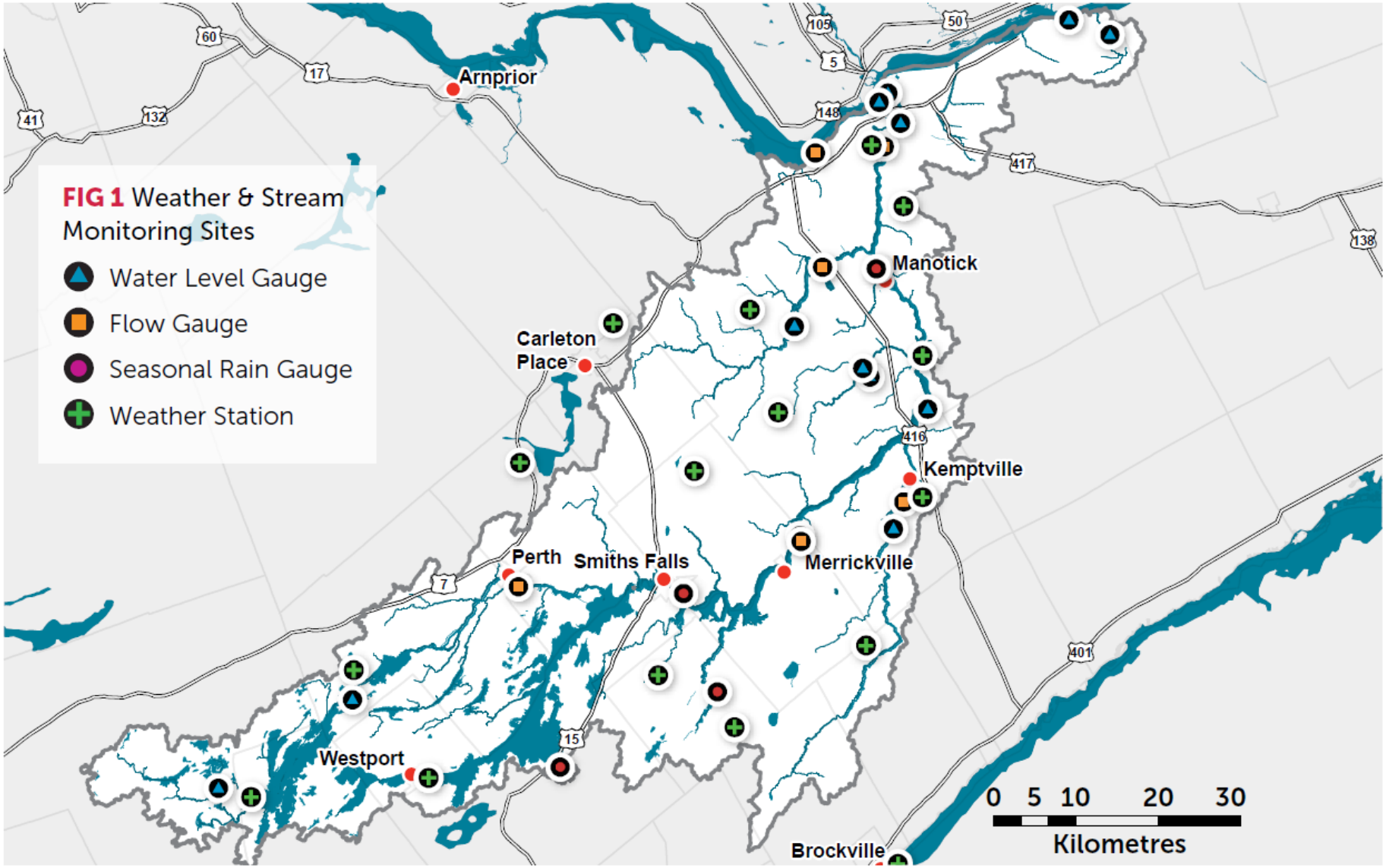
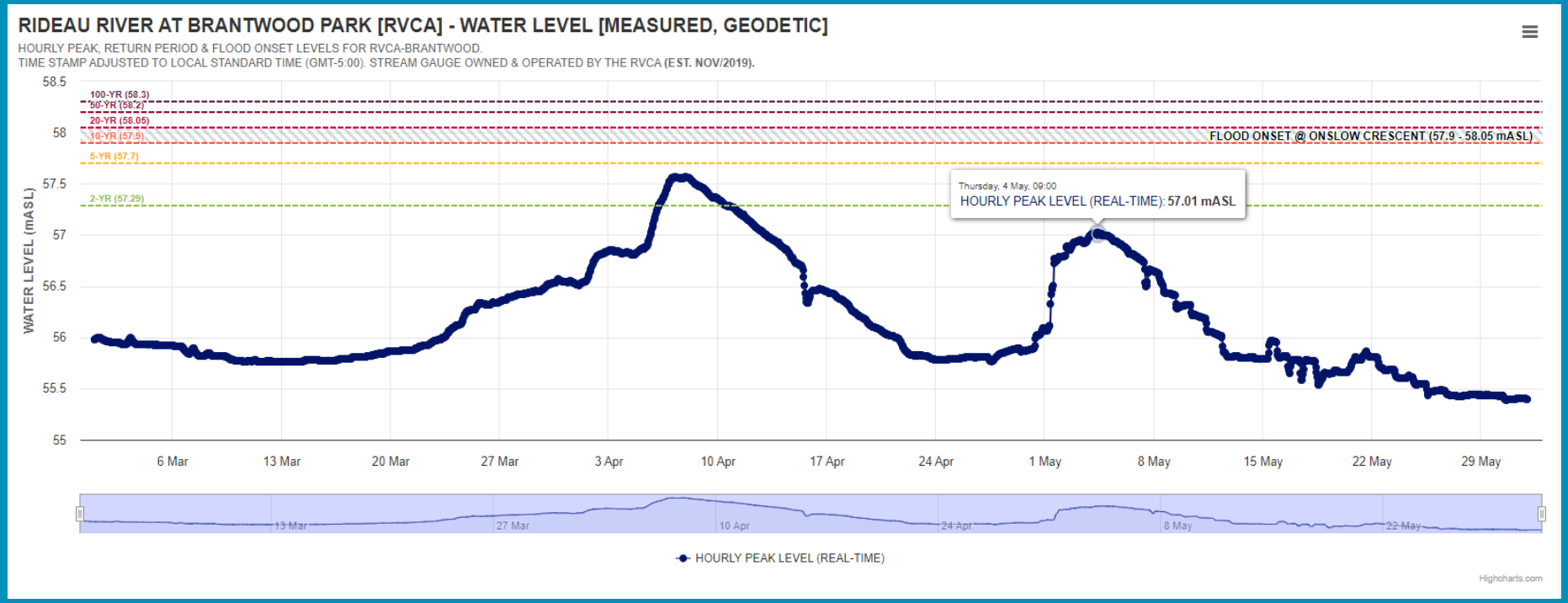


FIG 1 Weather & Stream Monitoring Sites
Water Level Gauge
Flow Gauge
Seasonal Rain Gauge
Weather Station
Arnprior
Carleton Place
Perth
Smiths Falls
Manotick
Kemptville
Merrickville
Westport
Brockville
60
17
41
132
105
50
5
148
417
138
416
7
15
401
0 5 10 20 30
Kilometres

Water Level & Flow Monitoring

- RVCA manages 9 water level stations (flood vulnerable areas)
- Cellular telemetry with hourly data transmission
- Alerting for approaching flood risk thresholds
- Cell reception / signal strength challenges



Weather Monitoring

- Recent initiative to improve weather monitoring in the region
- RVCA network of 11 remote weather monitoring systems
- GOES satellite telemetry with hourly transmissions
- Typically within 1-2 hours of current conditions

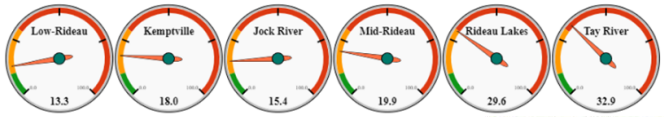
RVCA-CLIMATE : CLIMATE_CHART_B

CURRENT CONDITIONS				TA	TD	RH	PA	Δ24HR PA	WS (AVG)	PRECIPITATION [mm]			STATUS
STATION ID	OP	SUBW	DATE TIME [LST]	°C	°C	%	kPa	+ / - kPa	km/h	24HR	72HR	7DAY	
Ottawa Intl A	ECCC	LR	02/17/2022 18:00:00	-0.2	-0.6	98	100.73	-0.69	25.6	10.0	10.0	13.1	ACTIVE
Ottawa CDA	ECCC	LR	02/17/2022 18:00:00	-0.9	-1.7	96	100.73	-0.67	20.5	12.7	13.3	17.3	ACTIVE
Kemptville CS	ECCC	KV	02/17/2022 18:00:00	+1.0	-0.2	94	100.6	-0.87	12.6	15.3	15.4	20.2	ACTIVE
Brockville TBO	ECCC	KV	02/17/2022 18:00:00	+2.8	+2.0	96	100.55	-1.04	14.5	19.1	19.4	25.7	ACTIVE
Appleton CS	ECCC	JR	12/31/2021 00:00:00	---	---	---	---	---	---	---	---	---	OFFLINE
Drummond Centre	ECCC	TR	12/31/2021 00:00:00	---	---	---	---	---	---	---	---	---	OFFLINE
Mansfield	RVCA	JR	02/17/2022 20:00:00	-2.9	-4.1	94	99.23	-0.75	8.4	15.0	15.2	19.3	ACTIVE
Montague	RVCA	JR	02/17/2022 19:00:00	-0.6	-1.2	97	98.93	-0.77	3.8	16.1	16.1	22.7	ACTIVE
Carleton Place	MVC	JR	02/17/2022 19:00:00	-2.0	-3.2	94	98.85	-0.72	11.1	15.2	15.3	20.8	ACTIVE
Snowdons Corners	RVCA	KV	02/17/2022 19:00:00	+0.9	+0.7	99	99.18	-0.95	2.8	16.9	16.9	23.4	ACTIVE
Frankville	RVCA	KV / MR	02/17/2022 19:00:00	+0.4	-1.2	92	99.04	-0.99	---	20.7	20.7	26.4	ACTIVE
Kars	RVCA	LR	02/17/2022 20:00:00	-1.5	-2.5	95	99.38	-0.84	5.3	15.8	16.3	20.4	ACTIVE
Marlborough	RVCA	LR	02/17/2022 19:00:00	-0.1	-0.3	99	99.19	-0.72	3.1	14.6	14.7	20.6	ACTIVE
Greely	SNC	LR	02/17/2022 18:00:00	---	---	---	---	---	---	---	---	---	OFFLINE
Andrewsville	RVCA	MR	02/17/2022 19:00:00	+0.1	+0.1	100	99.35	-0.85	6.6	17.6	17.7	24.4	ACTIVE
Motts Mills	RVCA	MR	02/17/2022 19:00:00	+0.3	-0.1	98	99	-0.94	6.9	21.4	21.4	28.2	ACTIVE
Bobs Lake	RVCA	TR	02/17/2022 19:00:00	+0.2	-0.2	98	98.11	-1.03	3.8	35.9	35.9	46.2	ACTIVE
Rainbow Lake	RVCA	TR	02/17/2022 19:00:00	-0.1	-0.3	99	98.13	-0.90	5.3	29.9	29.9	39.5	ACTIVE
Westport	RVCA	UR	02/17/2022 19:00:00	+0.2	+0.2	100	98.08	-1.02	4.1	29.6	29.6	37.5	ACTIVE
Franktown	SEASONAL	JR	02/16/2022 04:00:00	---	---	---	---	---	---	0.0	0.0	3.6	ACTIVE
Mansfield (DAVIS)	SEASONAL	JR	02/17/2022 20:00:00	---	---	---	---	---	---	12.4	---	---	ACTIVE
RVCA Office	SEASONAL	LR	02/16/2022 05:00:00	---	---	---	---	---	---	0.0	0.0	0.0	ACTIVE
North Gower (Stevens)	SEASONAL	LR	02/17/2022 20:00:00	---	---	---	---	---	---	6.6	---	---	ACTIVE
North Gower (Taylor)	SEASONAL	LR	02/17/2022 20:00:00	---	---	---	---	---	---	11.4	---	---	ACTIVE
Smiths Falls STP	SEASONAL	MR	02/16/2022 04:00:00	---	---	---	---	---	---	0.0	0.0	5.2	ACTIVE
Irish Creek	SEASONAL	MR	02/16/2022 04:30:00	---	---	---	---	---	---	0.0	0.0	3.8	ACTIVE
Portland	SEASONAL	UR	02/16/2022 04:15:00	---	---	---	---	---	---	0.0	0.0	5.2	ACTIVE

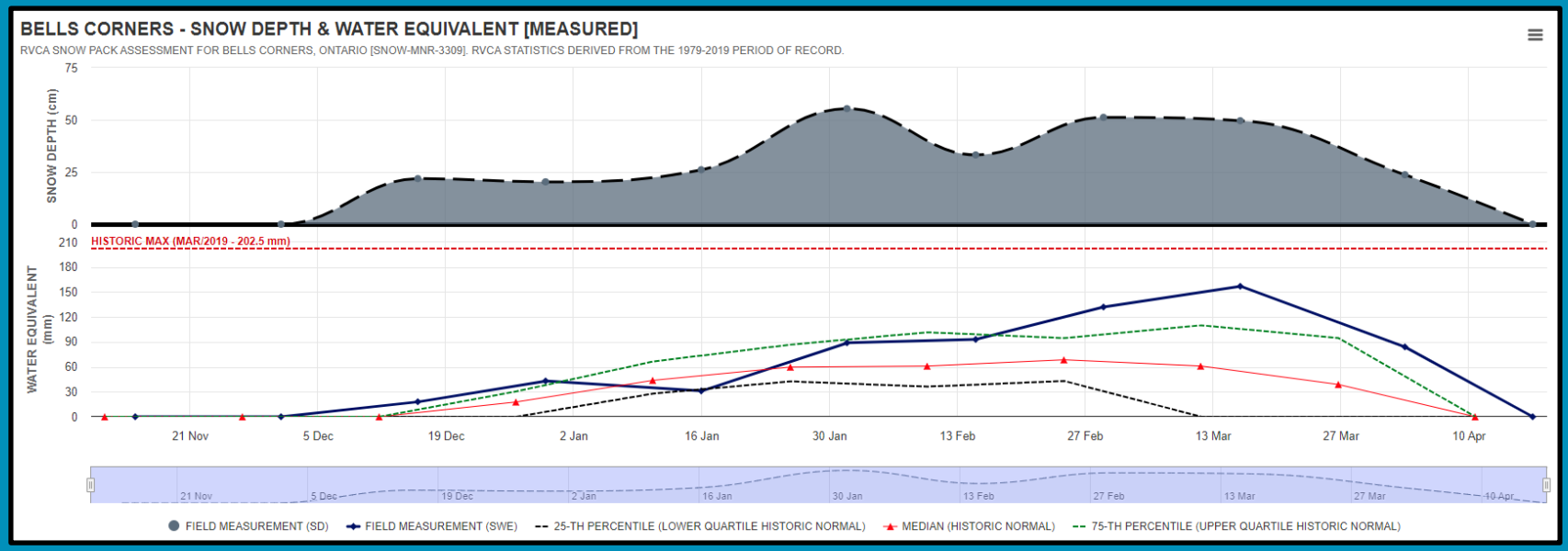
CLIMATE_CHART_B

Daily Precipitation Accumulation [mm]

RVCA Subwatersheds



Snow Monitoring



- Manual surveying at 6 sites bi-weekly
- Field survey app with real-time upload to data management software / public-facing tools
- Automated SWE measurement via GMON (PC)
- Also utilize gridded data products (NOAA SNODAS)

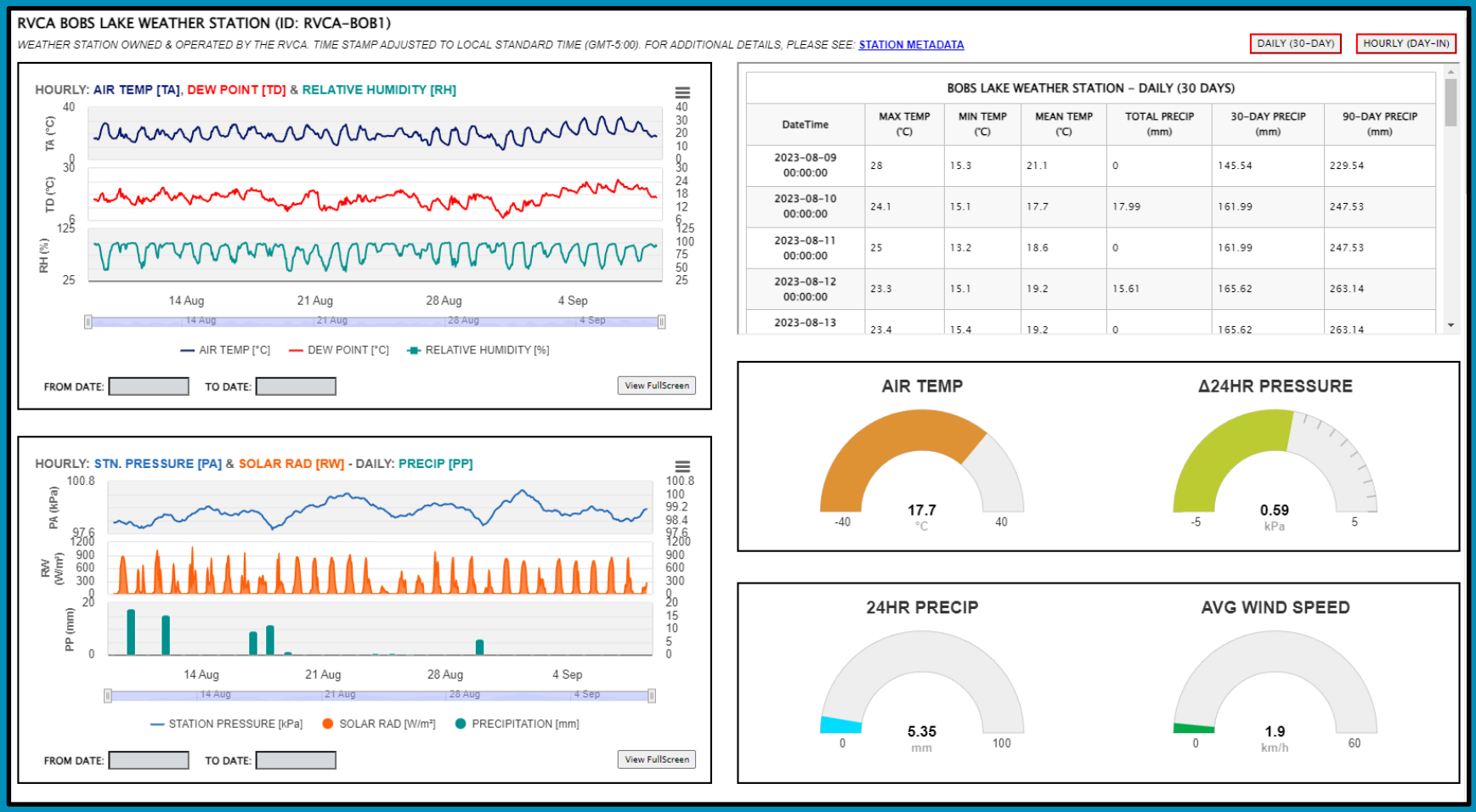
Data Management

- Data acquisition & polling primarily managed via KISTERS WISKI software and through custom programmatic methods
- Data reports are generated on a daily basis and archived (daily planning cycle)
- RVCA has developed a number of custom tools to assist with data review and interpretation:

Data Management

Example 1: Weather Station Dashboards

Rideau Valley Conservation Authority



Data Management

Example 2: Interactive Mapping Applications

Rideau Valley Conservation Authority

Stream Flow:

	Site	Flow (m^3/s)	Δ24hr (+/-)	25th %tile	75th %tile	mm-dd-24hr
1.	Rideau River at Ottawa:	**11.6** cms	-0.3 cms	6.92 cms	17.05 cms	09-11-06:00
2.	Jock River at Moodie Drive:	**0.77** cms	-0.07 cms	0.26 cms	1.05 cms	09-11-05:00
3.	Kemptville Ck at Kemptville:	**0.81** cms	-0.04 cms	0.06 cms	0.87 cms	09-11-06:00
4.	Tay River at Perth:	**3.71** cms	-0.03 cms	3.1 cms	6.29 cms	09-11-07:00
5.	Ottawa River at Britannia:	**746.7** cms	-32 cms	386.37 cms	674.28 cms	09-11-06:00

The interquartile range (data range between the daily 25th & 75th percentiles) represents the typical normal flows observed at this time of year over the historic record.

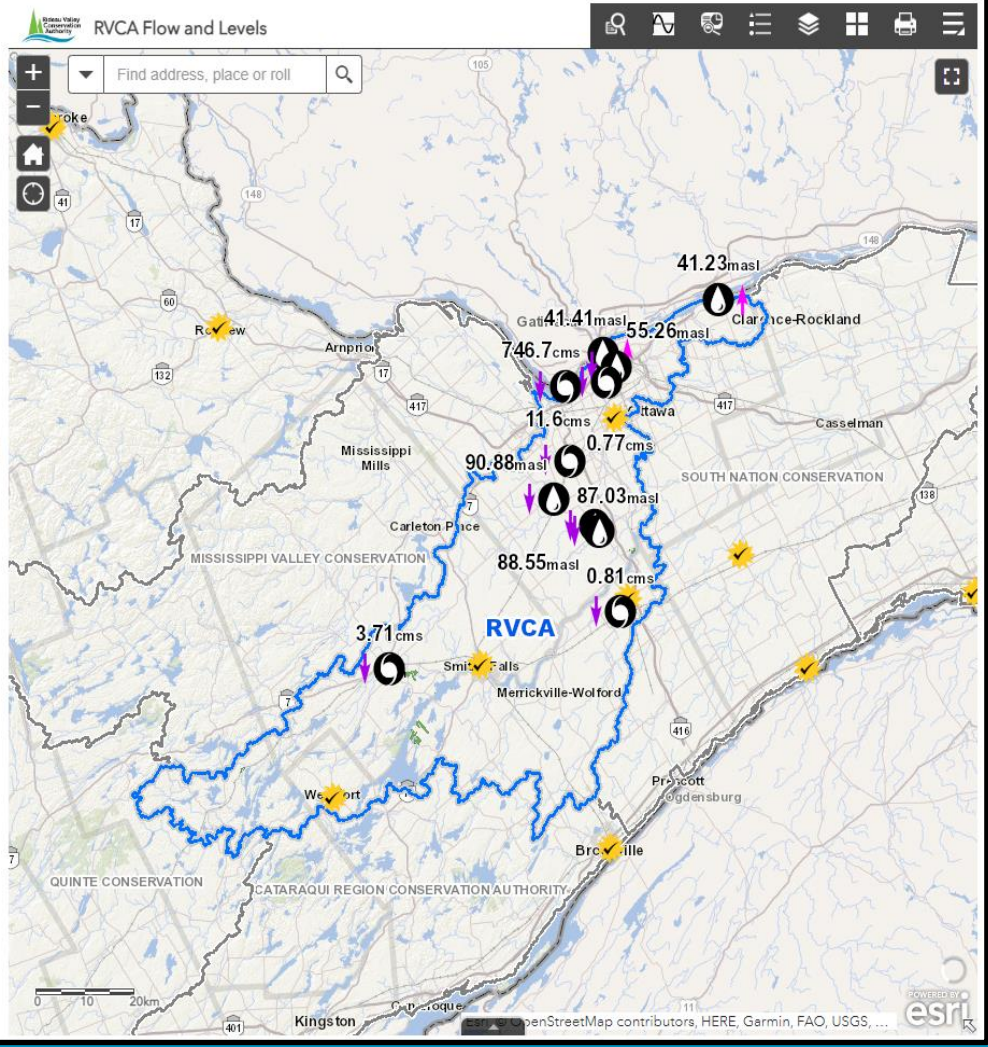
Refresh Table

Water Levels:

	Site	Owner	Level (masl)	Δ24hr (+/-)	mm-dd-24hr
1.	Rideau River at Baxter:	RVCA	OUT OF SERVICE		023-0--26T0
2.	Rideau River at Brantwood Park:	RVCA	**55.26** masl	-0.5 cm	09-11-06:00
3.	Ottawa River at Hull:	WSC	**41.41** masl	+3.8 cm	09-11-07:10
4.	Ottawa River at Britannia:	WSC	**57.9** masl	+2.1 cm	09-11-06:00
5.	Ottawa River at Cumberland:	RVCA	**41.23** masl	+3 cm	09-11-06:00
6.	Jock River at Richmond:	RVCA	**90.88** masl	-0.7 cm	09-11-06:00
7.	Stevens Creek at Perkins Dr:	RVCA	**87.03** masl	-5.2 cm	09-11-05:00
8.	Taylor Drain at 4th Line Rd:	RVCA	**88.55** masl	-0.1 cm	09-11-04:15
9.	Tay River at Perth:	WSC	**133.02** masl	+0.1 cm	09-11-07:00
10.	Upper Rideau at Narrows Lock:	PC	HISTORIC DATA*		10-05-12:00
11.	Bobs Lake:	PC	HISTORIC DATA*		10-05-12:00

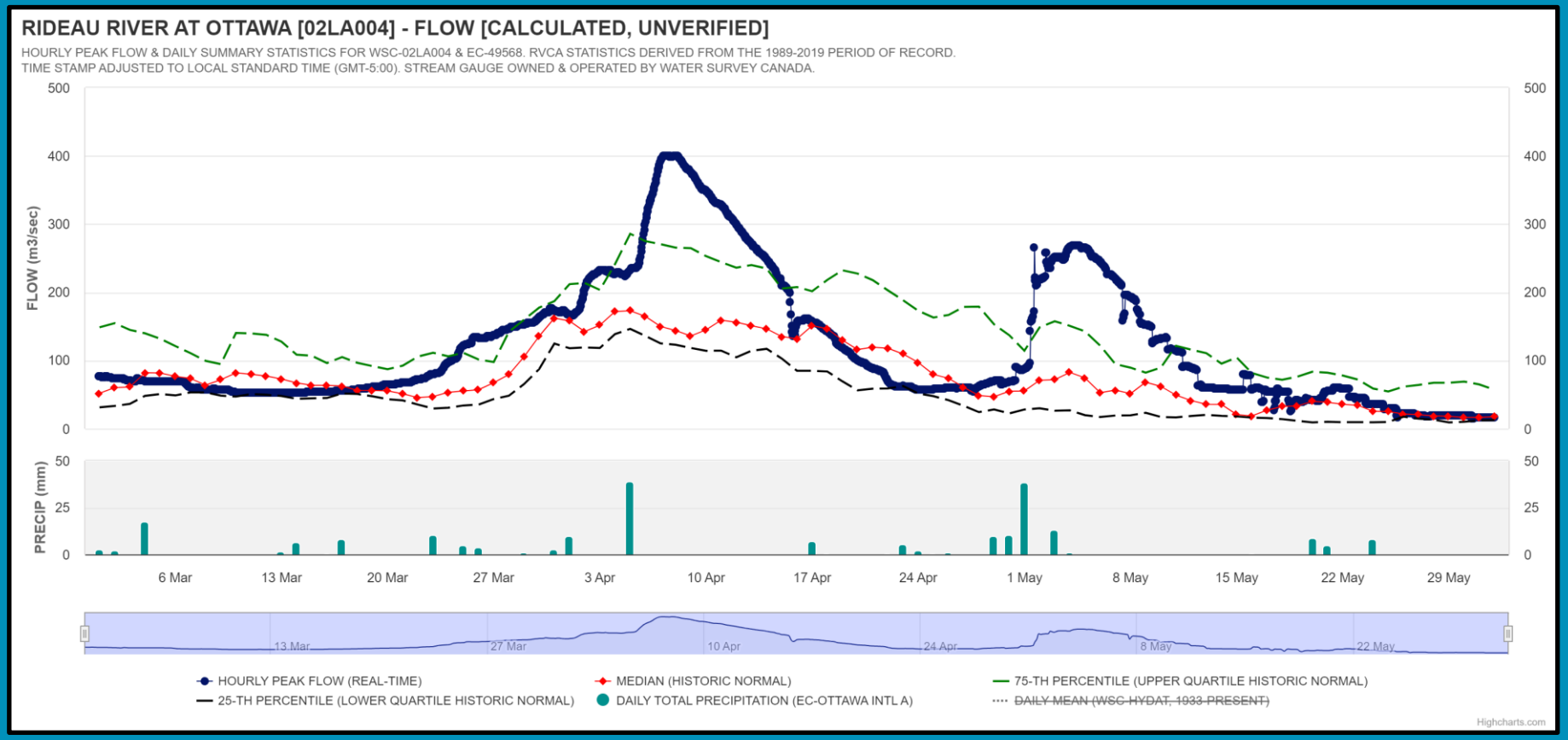
** Please be advised that Parks Canada water levels are no longer available through the RVCA data tools. Current water level information may be accessed through the Parks Canada Water Management InfoNet (see links below).*

Refresh Table



Data Management

Example 3: Dynamic Charting Applications



Data Management

Example 4: Automated Email Alerting System

RVCA Automated WISKI ALERT (AlertID: BHO1B)

WA hydrometrics@rvca.ca

Reply | Reply All | Forward

Wed 01/11/2023 1:49 PM

Active Alerts:

24HR Precipitation at Ottawa CDA (XOA) has exceeded 50 mm (Current: 10/28/2023 02:00 - 52 mm)

24HR Precipitation at Kars (KRS1) has exceeded 50 mm (Current: 11/01/2023 10:00 - 68 mm)

24HR Precipitation at Westport (WPT1) has exceeded 50 mm (Current: 11/01/2023 10:00 - 73.4 mm)

FORECAST 24HR Precipitation for Perth (NOAA GEFS) has exceeded 50 mm (11/06/2023 - 180 mm)

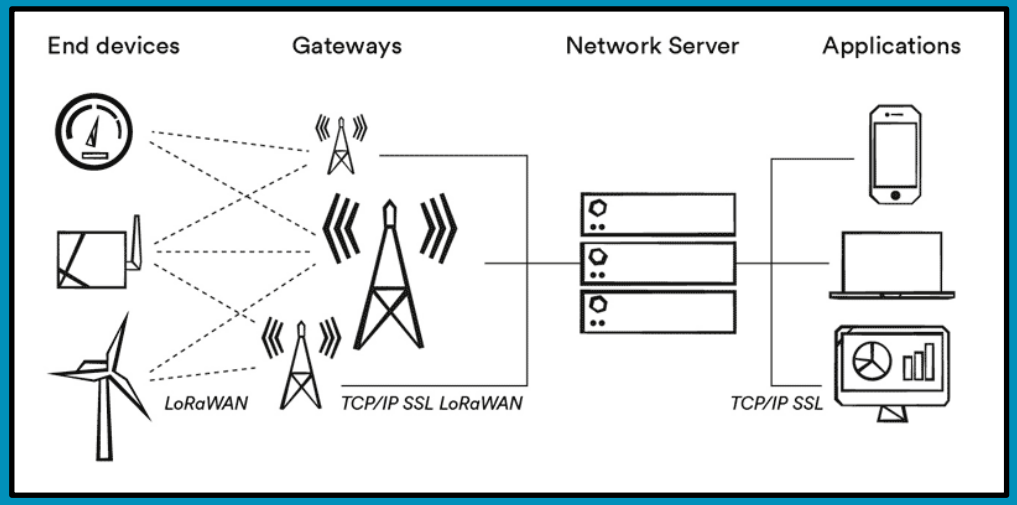
Station_ID	Parameter	Value_mm	Alert_Limit
Ottawa Intl A (YOW)	PP_24HR	1	50
Ottawa CDA (XOA)	PP_24HR	52	50
Kemptville CS (XKE)	PP_24HR	0	50
Brockville PCC (TBO)	PP_24HR	0	50
Andrewsville (ADV1)	PP_24HR	0.4	50
Bobs Lake (BOB1)	PP_24HR	0	50
Frankville (GIB1)	PP_24HR	0	50
Kars (KRS1)	PP_24HR	68	50
Mansfield (MFD1)	PP_24HR	0.3	50
Marlborough (MLB1)	PP_24HR	0.4	50
Motts Mills (MMS1)	PP_24HR	0.3	50
Montague (MTG1)	PP_24HR	0.5	50
Rainbow Lake (RBL1)	PP_24HR	0.1	50
Snowdens Corners (SDC1)	PP_24HR	0.1	50
Westport (WPT1)	PP_24HR	73.4	50
Greely (SNC-GRL1)	PP_24HR	0	50
Carleton Place (MVC-CTP1)	PP_24HR	0.1	50
Franktown (Rain Gauge)	PP_24HR	0	50
RVCA Office (Rain Gauge)	PP_24HR	0	50
RVCA Office (WQ ALERT)	PP_24HR	0	50
Smiths Falls STP (Rain Gauge)	PP_24HR	0	50
Irish Creek (Rain Gauge)	PP_24HR	0	50

In Development

Rideau Valley Conservation Authority

Radio-based telemetry (LoRaWAN) – Lake Level Monitoring

- Over 30 developed lakes in the Rideau Valley watershed
- Cost-prohibitive to deploy a full network of standard hydrometric stations
- Participation from lake residents for real-time communication (radio nodes connected through residential ISPs)
- Custom RVCA data platform has been developed and is currently being tested



In Development

Radio-based telemetry (LoRaWAN) – Lake Level Monitoring

Rideau Valley Conservation Authority

Advantages:

- Long transmission distance with low power consumption
- Open source & transmits on an unlicensed (free) radio band
- LoRaWAN transmission is secure (uses data encryption & authentication)
- Optimized for rapid data access (MQTT protocol)
- Can be integrated with industry grade sensors (e.g. OTT PLS 500)

In Development

Radio-based telemetry (LoRaWAN) – Lake Level Monitoring

Disadvantages:

- Requires custom network development
- Relatively untested in our region
- Radio nodes require line of sight
- Requires public participation (as developed)

Thank you

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