



# Innovations in the Western Ontario WISKI Hub

Mark Helsten, P.Eng., M.E.Sc - Senior Water Resources Engineer

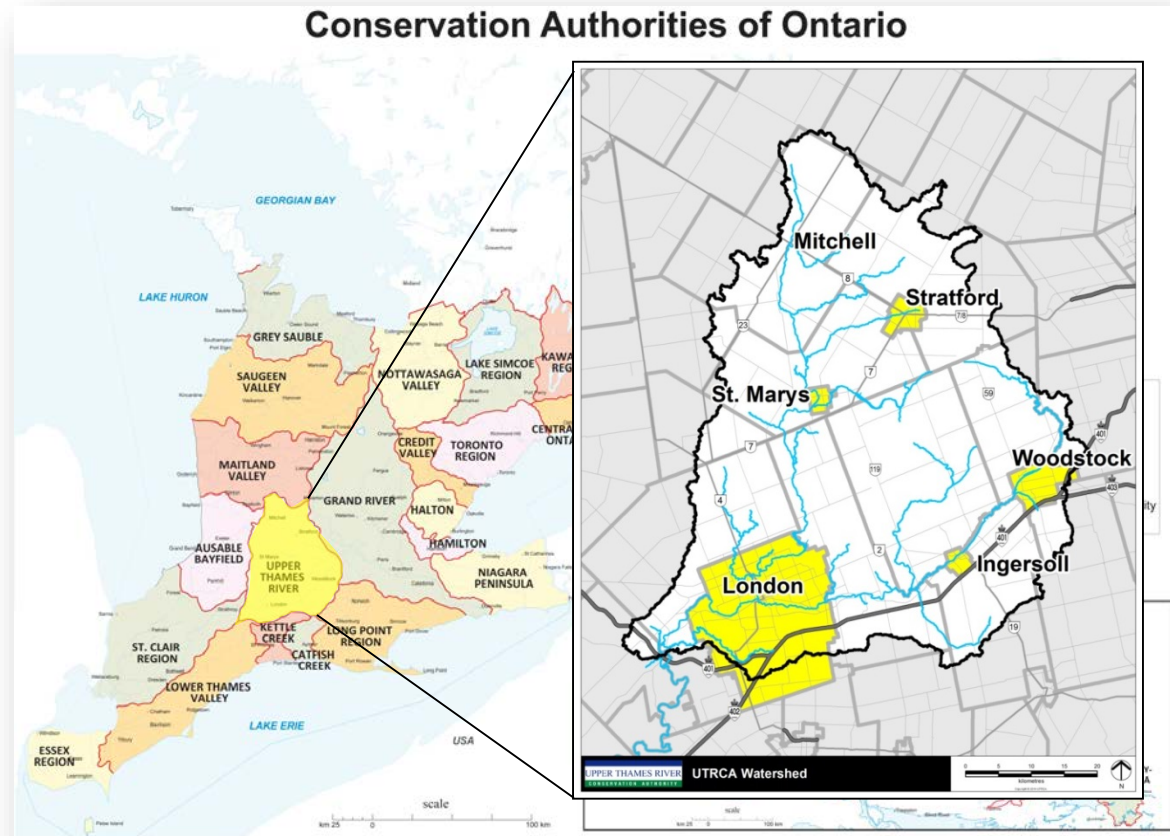
Laura Flynn, M.Sc. - Water Management Data Specialist

# Outline

- UTRCA and Western Ontario WISKI Hub
- WISKI Overview
- WOED Webpage
- Tools and Reporting

# Upper Thames River Conservation Authority (UTRCA)

- 3,400 square km
- 515,000 residents
- Mix of rural and urban land uses
- Thames River goes to Lake St. Clair, which flows into Lake Erie, Lake Ontario and the St. Lawrence River



# History

- Pre 2010 – UTRCA custom software solutions
- WISKI 7 - 2010 – present
- WISKI hub, started organizing 2016
- Formal participation by other members in 2017

# Western Ontario WISKI Hub

- 10 openings possible (as per Eastern Ontario Hub, out of Quinte Region CA)
- Currently 9 CA members
  - 7 in the South
  - 2 in the North





# WISKI Hub Model

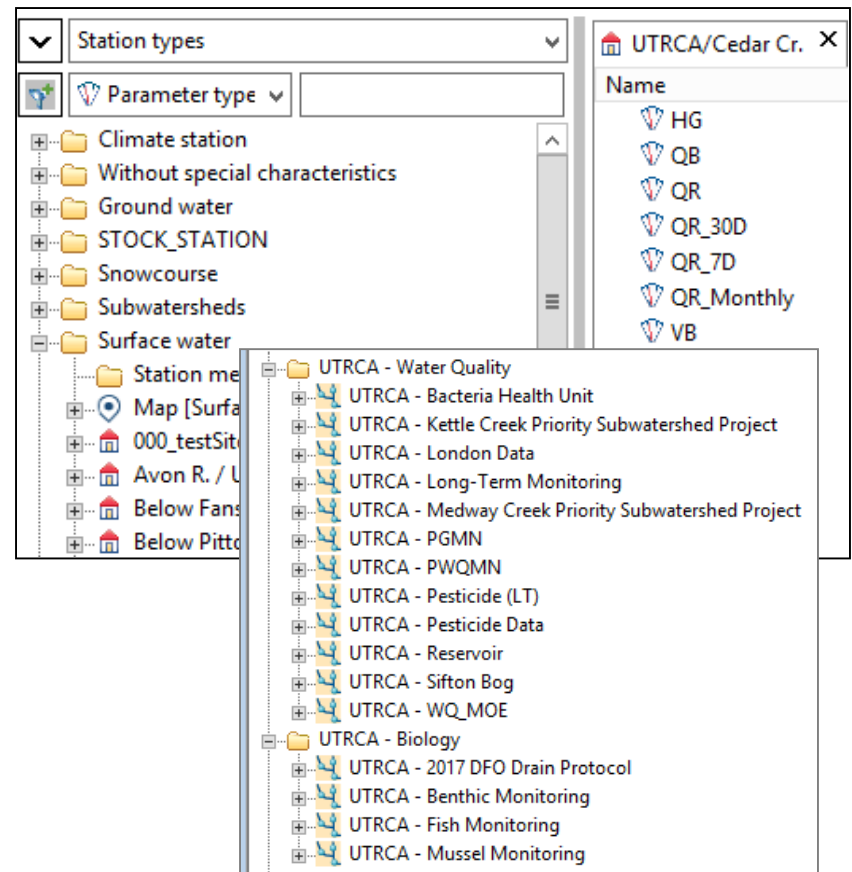
- Each member purchases and maintains own WISKI license, but server based license costs are shared
  - i.e. SODA, kiWIS, Alarm Manager
- Hardware costs and hardware reserve funds shared
- Also looking at subscription models for small CAs

# WISKI Hub Advantages

- Shared costs
- Shared knowledge
- Shared standards
  - e.g. WQ report card standards only need to be built once
- Shared scripts, kiWIS applications, data input methods
- Shared training sessions and costs

# WISKI Overview

- Relational database that incorporates:
  - Data acquisition and storage
  - Data validation and editing
  - Analysis and reporting
  - Controlled data sharing
- Used for continuous time series and discrete sampling data (hydrometric, water quality, biological)



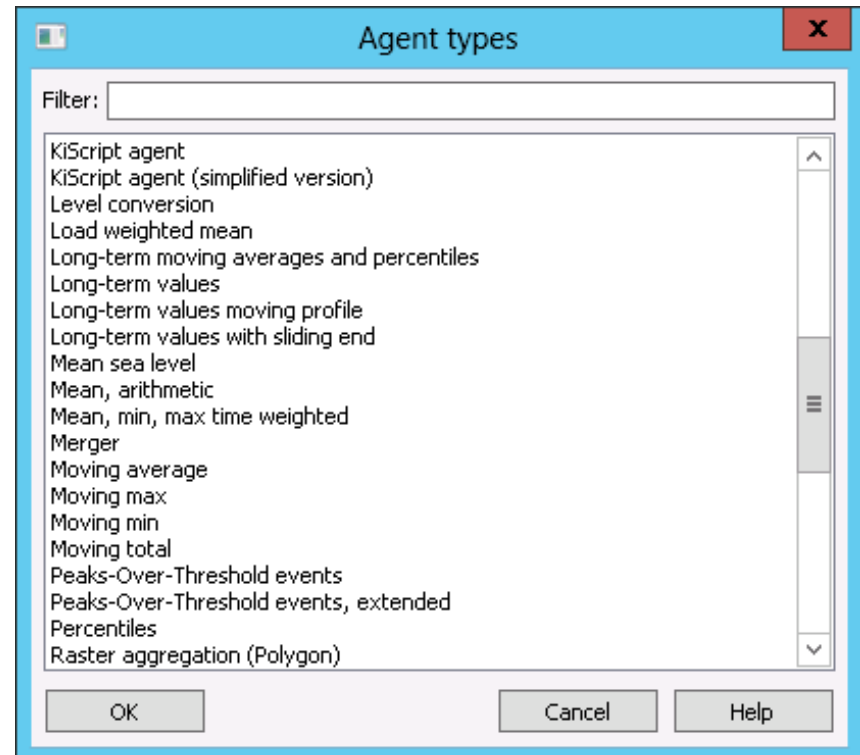


# WISKI Overview

Data type	Current use	Imported via	
Hydrometric	Surface water, climate, snow course and ground water monitoring stations	SODA <ul style="list-style-type: none"> <li>• data acquisition program</li> <li>• connects remotely to stations through phone lines (and cell)</li> </ul>	kiDAT <ul style="list-style-type: none"> <li>• Collects data from web sites, ftp sites and hot folders, and/or</li> <li>• Converts data files to ZRXP files for import</li> </ul>
Sampling (water quality & biology)	Water quality monitoring, land use surveys and aquatic wildlife inventory/monitoring	WISKI Importer <ul style="list-style-type: none"> <li>• customized import configurations built to match file formats (e.g. lab reports)</li> </ul>	kiDSM <ul style="list-style-type: none"> <li>• Automated data transfer jobs (hot folders)</li> <li>• .bat and .txt files link to import configurations</li> </ul>

# Time Series Agents

- What are they?
  - Algorithms that operate on time series data
  - Import new data into a time seriesand/or
  - Derive a new time series from a set source time series



# Agent Progression

Name	Data from	Data until
01.UT.PP.1.O	7/13/1984 14:00:00	9/17/2018 11:00:00

“Import  
time series  
data” agent

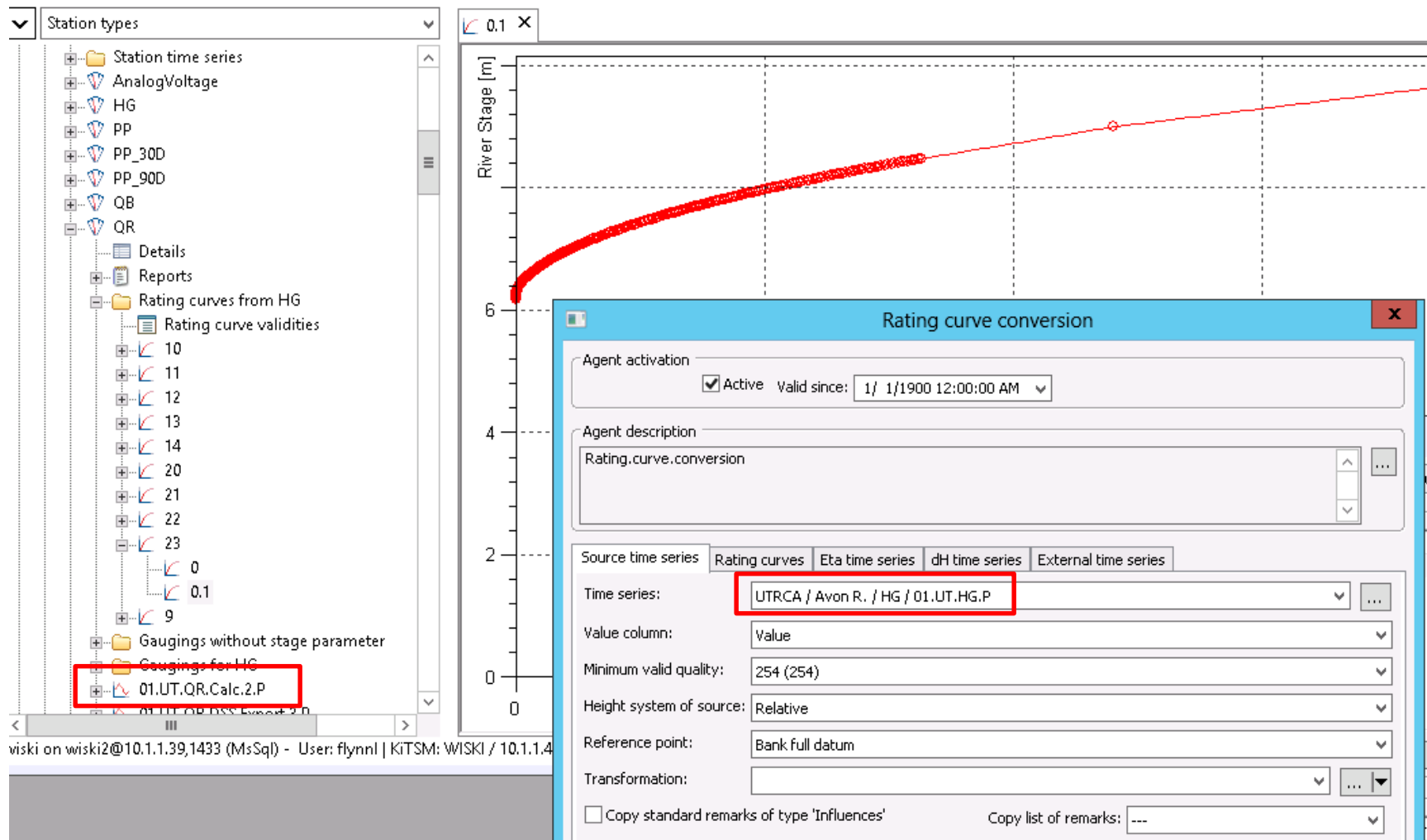
Name	Data from	Data until
01.UT.PP.1.O	7/13/1984 14:00:00	9/17/2018 11:00:00
01.UT.PP.2.P	7/13/1984 14:00:00	9/17/2018 11:00:00

“Copy time  
series” agent

Name	Data from	Data until
01.UT.PP.1.O	7/13/1984 14:00:00	9/17/2018 11:00:00
01.UT.PP.2.P	7/13/1984 14:00:00	9/17/2018 11:00:00
01.UT.PP.daily.P	7/13/1984 00:00:00	9/17/2018 00:00:00
01.UT.PP.monthly.P	7/1/1984 00:00:00	9/1/2018 00:00:00

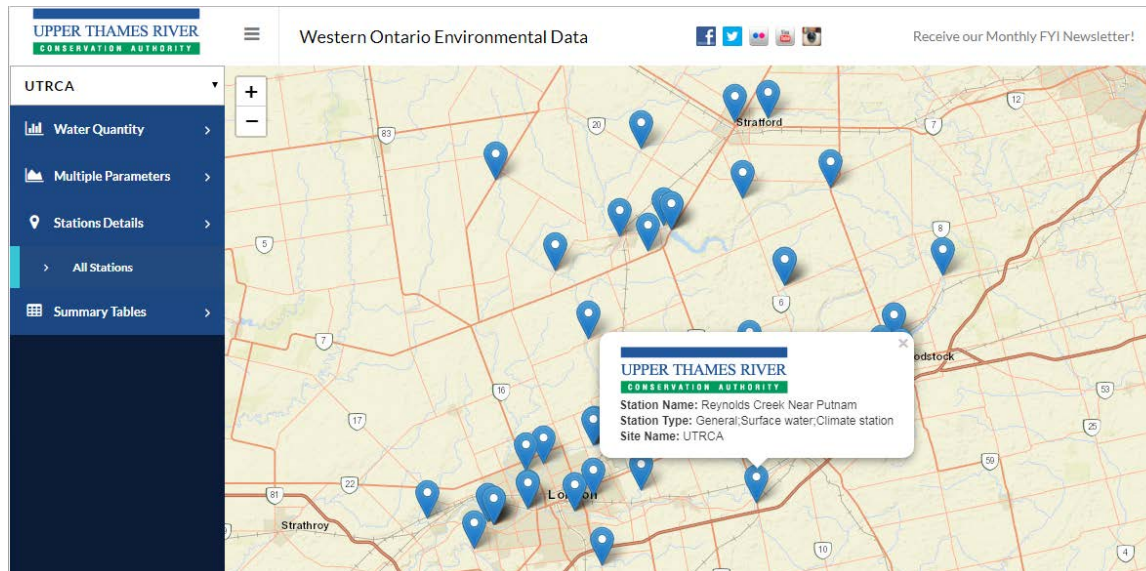
Other: e.g.  
“Total,  
simple”

# “Rating Curve Conversion” Agent



# Western Ontario Environmental Data (WOED) Webpage

- Interactive webpage for accessing hydrometric data that is stored within WISKI
- kiWIS pulls data using customized URLs



<http://10.1.1.49:8090/KiWIS/KiWIS?service=kisters&type=queryServices&request=getStationList&datasource=0&format=html&returnfields=station name,object type,station no,station longname,site name,station id,station latitude,station longitude,custom attributes&custattr returnfields=GENERAL.WOED&site name=UTRCA>



# WOED Webpage

- WISKI groups allow kiWIS to refine data pulls and maintain flexibility in the webpage (e.g. include new stations, new CAs, etc.)

The screenshot displays the Western Ontario Environmental Data (WOED) webpage. The header includes the Upper Thames River Conservation Authority logo, a navigation menu, the title "Western Ontario Environmental Data", social media links, and a newsletter sign-up. The left sidebar shows a navigation menu with "River Discharge" selected. The main content area is titled "River Discharge" and features a search bar, date range selectors (From: 26/07/2018, To: 02/08/2018), a list of stations (Avon River Above Stratford, Avon River Below Stratford, Cedar Creek At Woodstock, Dingman Creek Below Lambeth, Fanshawe Reservoir, Fish Creek Near Prospect Hill, Medway River At London, Middle Thames River At Thamesford), and buttons for "Add", "Remove", and "Plot Timeseries".

UPPER THAMES RIVER  
CONSERVATION AUTHORITY

Western Ontario Environmental Data

Receive our Monthly FYI Newsletter!

UTRCA

Water Quantity

Precipitation (incremental)

Air Temperature

River Stage

River Discharge

Multiple Parameters

Stations Details

Summary Tables

## River Discharge

Search by Location or Timeseries ID

From: 26/07/2018 To: 02/08/2018

Avon River Above Stratford  
Avon River Below Stratford  
Cedar Creek At Woodstock  
Dingman Creek Below Lambeth  
Fanshawe Reservoir  
Fish Creek Near Prospect Hill  
Medway River At London  
Middle Thames River At Thamesford

Add →

← Remove

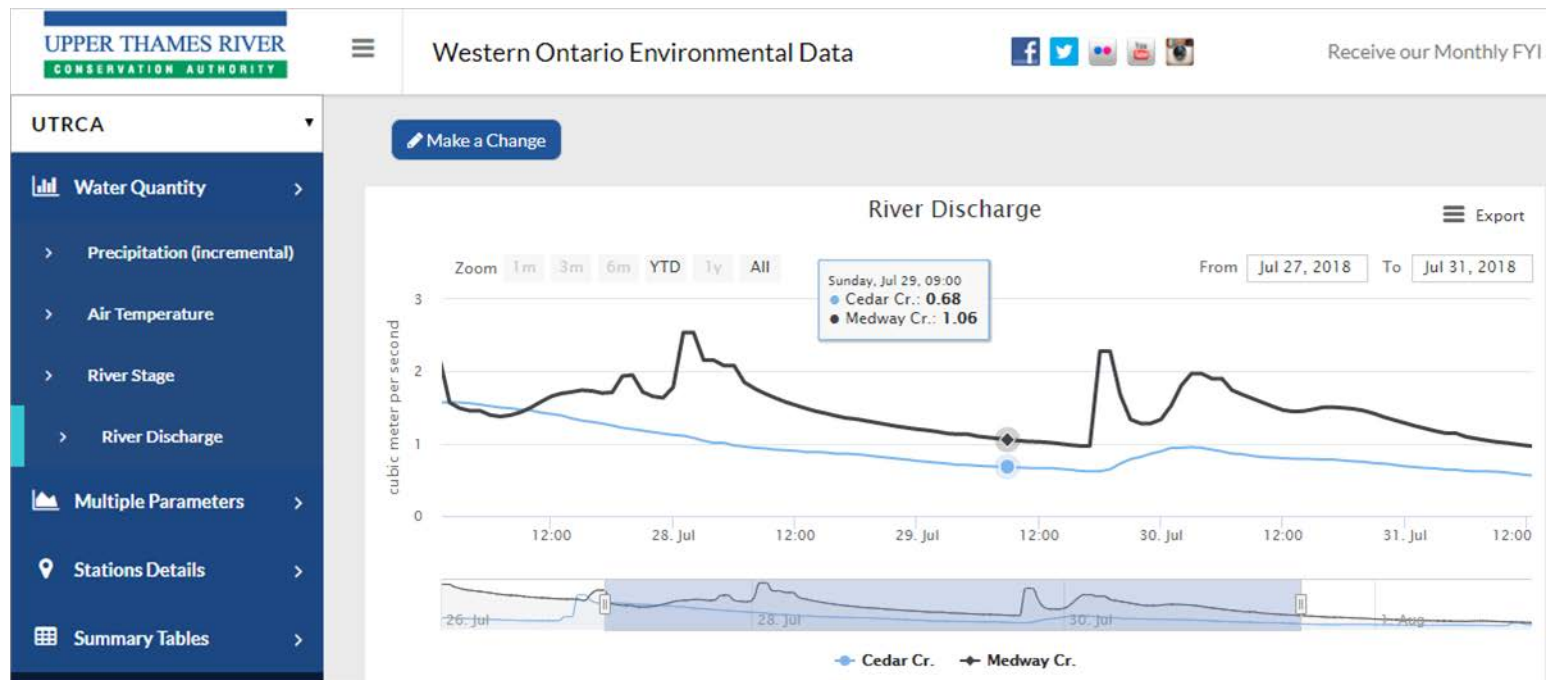
Plot Timeseries





# WOED Webpage

- Along with kiWIS, HiCharts and customized scripts display the station and time series data in interactive maps, graphs, charts and tables.



# Tools and Reporting

- kiScript
- kiWIS
- Data Entry
- WISKI features

# KiScript

- Written in a relatively easy to understand language
- Online support forum
- Kisters NA experts
- Documentation
  - Reference HTML doc plus extensive course notes
- Run automatically on a set schedule via task scheduler (or could use kiDat or KiDSM)
- Automatically post relevant reports to UTRCA web site

# KiScript

- Summary tables
  - Based on parameters to be summarized, and station groups
  - Helpful in the daily planning cycle process

# Data Summary Table

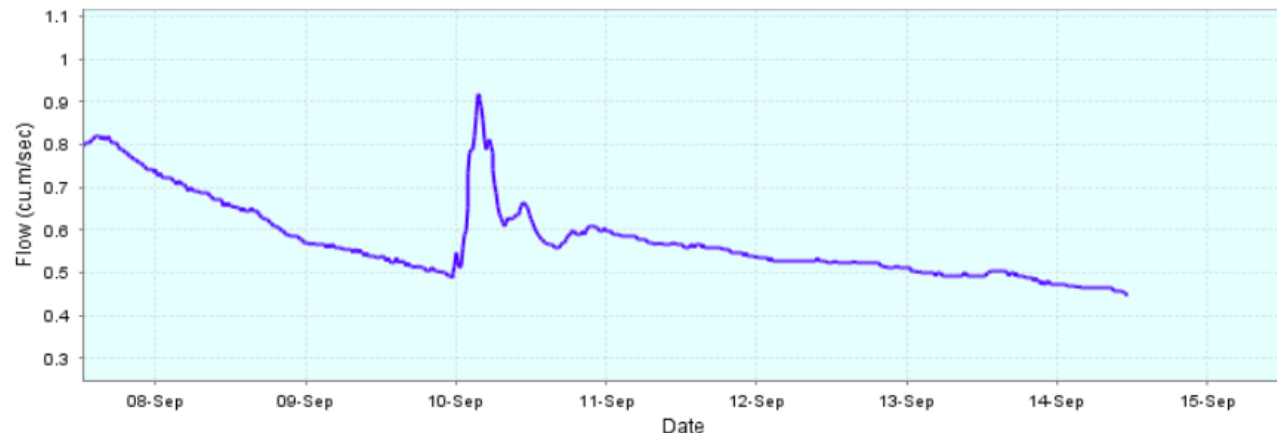
UTRCA 14-Sep-2018 12:22 EST

<input checked="" type="checkbox"/>	Last poll okay	Discharge Summaries													
<input type="checkbox"/>	Last poll missed														
<input type="checkbox"/>	Last poll yesterday, or before														
Last Poll	Location	Last Data Time	Hourly Change	Last hour	Last 2 hr	Last 3 hr	Today's Average	Today max	Today Min	2 Day Average	2d max	2D min	7 Day Average	7D max	7D min
		(EST)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)	(m <sup>3</sup> /sec)
<input checked="" type="checkbox"/>	Mitchell	14-Sep-2018 11:00	-0.0	2.2	2.23	2.25	2.19	2.27	2.15	2.14	2.27	2.0	1.47	2.27	0.77
<input checked="" type="checkbox"/>	Avon R.	14-Sep-2018 11:00	-0.0	0.34	0.35	0.36	0.38	0.41	0.34	0.38	0.42	0.32	0.45	0.85	0.32
<input checked="" type="checkbox"/>	Wildwood Reservoir	14-Sep-2018 11:00	0.0	1.99	1.99	1.99	1.99	1.99	1.99	1.99	2.0	1.99	2.35	2.94	1.99
<input checked="" type="checkbox"/>	St. Marys	14-Sep-2018 11:00	+0.0	2.63	2.61	2.61	2.58	2.63	2.53	2.59	2.66	2.51	2.89	4.05	0.36
<input checked="" type="checkbox"/>	Plover Mills	14-Sep-2018 11:00	-0.0	3.1	3.11	3.13	3.14	3.19	3.1	3.16	3.23	3.1	3.67	5.05	1.19
<input checked="" type="checkbox"/>	Fanshawe Reservoir	14-Sep-2018 11:00	0.0	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	3.11	4.66	2.17
<input checked="" type="checkbox"/>	Below Fanshawe Dam	14-Sep-2018 11:00	-0.0	3.43	3.46	3.44	2.43	3.54	1.44	2.62	3.71	1.44	4.98	7.94	1.44
<input checked="" type="checkbox"/>	Medway Cr.	14-Sep-2018 11:00	-0.0	0.45	0.46	0.46	0.46	0.48	0.45	0.48	0.51	0.45	0.56	0.92	0.45
<input checked="" type="checkbox"/>	Innerkip	14-Sep-2018 11:00	-0.0	0.19	0.2	0.2	0.21	0.22	0.19	0.22	0.25	0.19	0.24	0.34	0.19
<input checked="" type="checkbox"/>	Pittock Reservoir	14-Sep-2018 11:00	0.0	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
<input checked="" type="checkbox"/>	Cedar Cr.	14-Sep-2018 11:00	-0.0	0.91	0.92	0.93	0.92	0.93	0.9	0.93	0.97	0.9	0.97	1.53	0.83
<input checked="" type="checkbox"/>	Ingersoll	14-Sep-2018 11:00	-0.0	2.37	2.42	2.54	2.5	2.59	2.37	2.54	2.67	2.37	2.62	3.31	2.05
<input checked="" type="checkbox"/>	Thamesford	14-Sep-2018 11:00	+0.0	1.13	1.12	1.12	1.13	1.14	1.12	1.15	1.2	1.12	1.27	1.51	1.12
<input checked="" type="checkbox"/>	Waubuno Cr.	14-Sep-2018 11:00	0.0	0.31	0.31	0.31	0.32	0.33	0.31	0.33	0.35	0.31	0.35	0.4	0.31
<input checked="" type="checkbox"/>	Ealing	14-Sep-2018 11:00	0.0	7.01	7.01	6.98	6.95	7.04	6.86	7.07	7.28	6.86	7.61	8.81	6.86
<input checked="" type="checkbox"/>	Byron	14-Sep-2018 11:00	+0.0	10.04	10.03	9.93	10.11	10.54	9.79	9.47	10.79	8.47	12.36	16.67	8.47
<input checked="" type="checkbox"/>	Dingman Cr. - Westdel Bourne	14-Sep-2018 11:00	0.0	0.16	0.16	0.16	0.17	0.19	0.16	0.18	0.21	0.16	0.25	0.71	0.16
<input checked="" type="checkbox"/>	Reynolds Cr.	14-Sep-2018 11:00	0.0	0.45	0.45	0.46	0.46	0.47	0.45	0.46	0.47	0.44	0.47	0.53	0.42
<input checked="" type="checkbox"/>	Fairview	14-Sep-2018 11:00	0.0	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.09	0.09	0.08
<input checked="" type="checkbox"/>	Oxbow Cr.	14-Sep-2018 11:00	0.0	0.35	0.35	0.35	0.34	0.35	0.33	0.36	0.39	0.33	0.36	0.45	0.28
<input type="checkbox"/>	Stoney Cr.	14-Sep-2018 01:00	0.0	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.15	0.04
<input type="checkbox"/>	Upper Avon	14-Sep-2018 11:00	+0.0	0.21	0.2	0.2	0.21	0.21	0.2	0.21	0.22	0.2	0.23	0.27	0.2
<input type="checkbox"/>	Fish Cr.	14-Sep-2018 09:00	0.0	0.07	0.07	0.07	0.07	0.08	0.07	0.09	0.1	0.07	0.1	0.16	0.07
<input checked="" type="checkbox"/>	Below Wildwood Dam	14-Sep-2018 11:00	-0.0	4.21	4.23	4.21	4.21	4.28	4.19	4.21	4.28	4.19	4.7	5.57	4.12
<input checked="" type="checkbox"/>	Tavistock	14-Sep-2018 10:00	0.0	0.14	0.14	0.14	0.14	0.15	0.14	0.15	0.15	0.14	0.15	0.17	0.14
<input type="checkbox"/>	Dingman Cr. US	13-Sep-2018 09:00	---	---	---	---	---	---	---	---	---	---	---	---	---
<input type="checkbox"/>	Pottersburg Cr.	31-Jul-2018 08:30	---	---	---	---	---	---	---	---	---	---	---	---	---
<input checked="" type="checkbox"/>	Nissouri Cr.	14-Sep-2018 11:00	0.0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.11	0.13	0.16	0.11

# Data Plots

- Data Plots
  - Based on parameter to be plotted, and station groups

**UTRCA Water Level Monitoring System  
Medway River At London: Flow (cu.m/sec)  
(Sep 07, 2018 - Sep 15, 2018)**



Sep 14, 2018 12:20 EST. Average Flow = 0.577 cms \*Caution: Provisional Data!\*\*\*\*

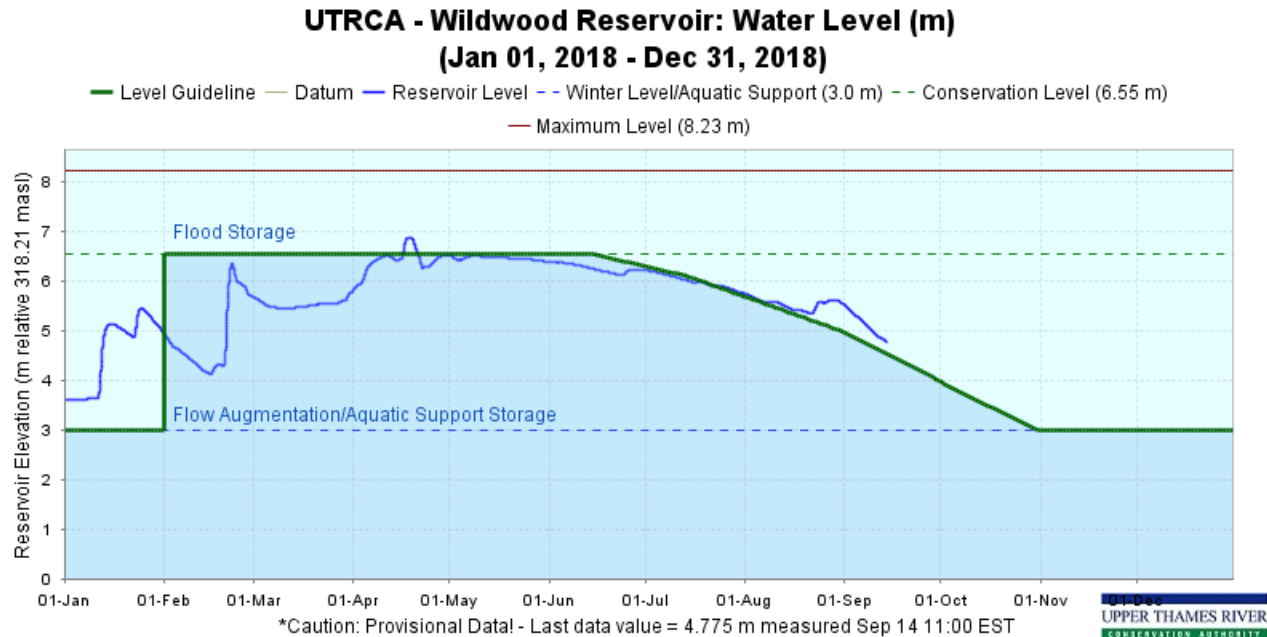
— Medway River At London

UPPER THAMES RIVER  
CONSERVATION AUTHORITY



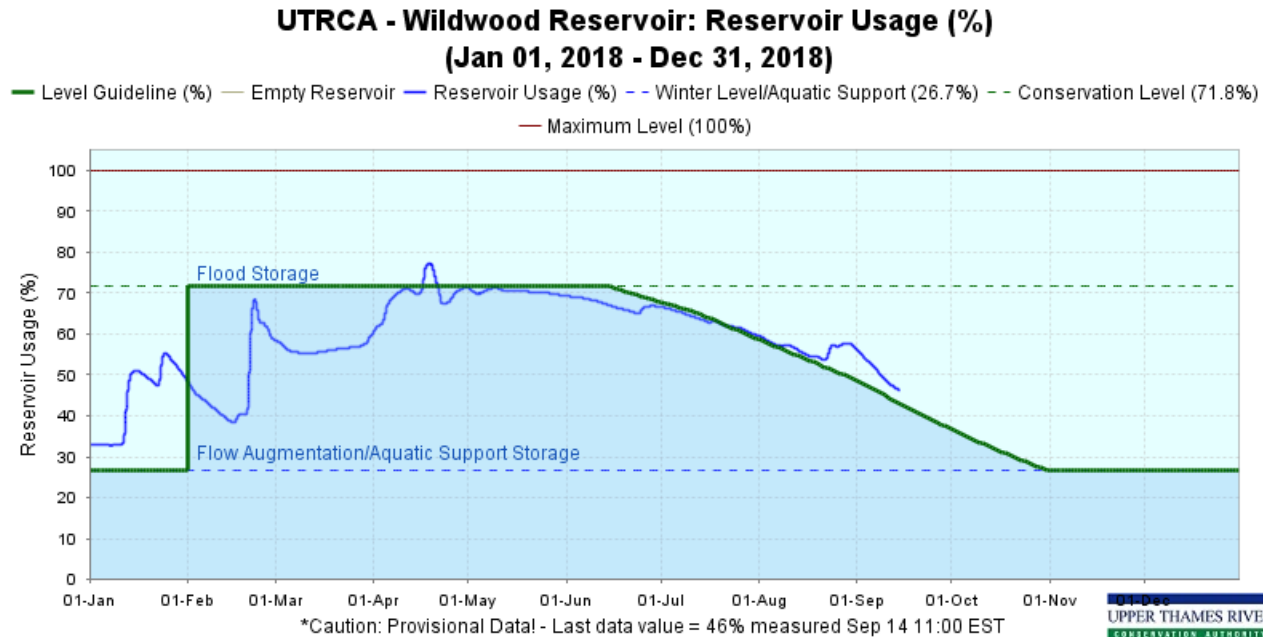
# Reservoir Plots

- Reservoir levels



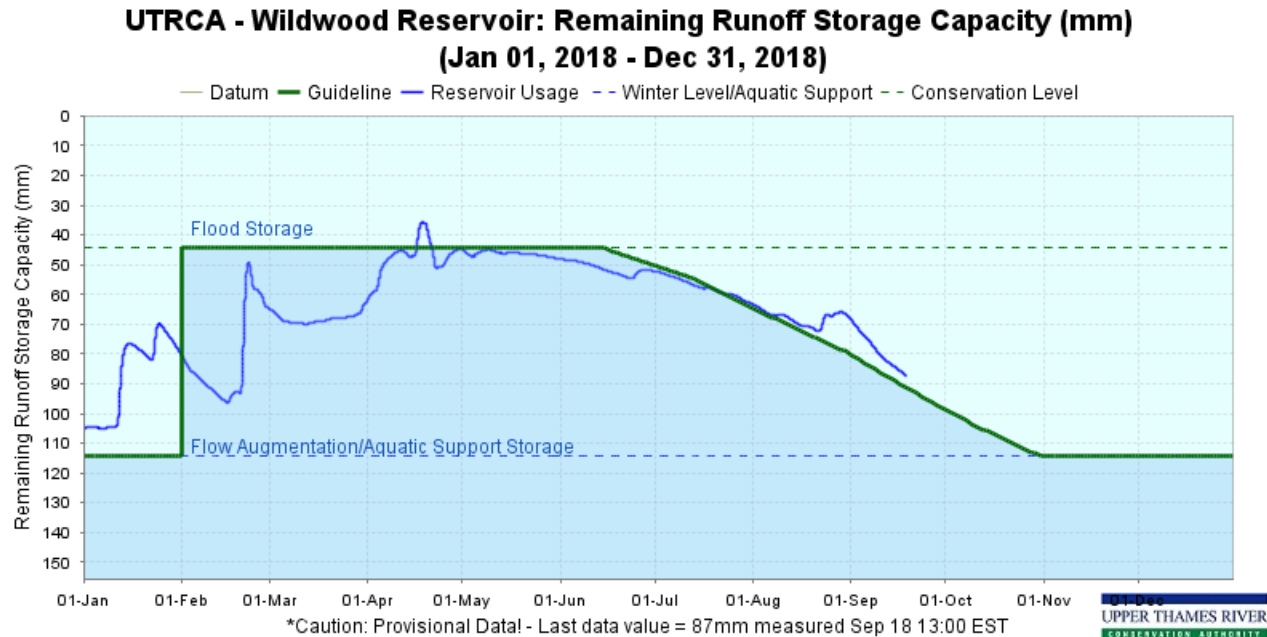
# Reservoir Plots

- Percent reservoir usage



# Reservoir Plots

- mm runoff storage remaining



# Dam Operations Summary

## UTRCA Gate Summary (Manual Entry) 14-Sep-2018 14:03

Gate Settings							
Location	Last Operation Time	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5	Gate 6
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Wildwood Reservoir	10-Sep-2018 10:50	0.00	0.00	0.06	0.00		
Fanshawe Reservoir	13-Sep-2018 10:30	30.00	30.00	30.00	30.00	30.00	6.00
Pittock Reservoir	07-Sep-2018 13:55	0.00	0.00	3.00	0.00	0.00	

Blank cell --- control does not exist at that dam

## UTRCA Valve Summary (Manual Entry) 14-Sep-2018 14:03

Valve Settings					
Location	Last Operation Time	Valve 1 / Hydro	Valve 2 / Large Vane	Valve 3 / Small Vane	Bypass Valve
		(%)	(%)	(%)	(%)
Wildwood Reservoir	10-Sep-2018 10:50	0.00	75.00	100.00	
Fanshawe Reservoir	13-Sep-2018 10:30	30.00	0.00	90.00	0.00
Pittock Reservoir	07-Sep-2018 13:55	15.00			

Blank cell --- control does not exist at that dam

# Misc KiScript

- Daily export of hourly data to HEC-DSS database for use in HEC-HMS model
- Inverse distance model to distribute snow data (or other parameters that make sense) to defined subwatersheds
- Data plots in groups of stations for same parameter
- Annual percentile plots (for OWLR)

# Dam operations

DamEntry.xlsm - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer

Clipboard: Cut, Copy, Paste, Format Painter

Font: B, I, U, A, A

Paragraph: Wrap Text, Merge & Center

Numbers: \$, %, .00, .00

Conditional Formatting, Format as Table, Cell Styles

Insert, Delete, Format

AutoSum, Fill, Clear, Sort & Filter, Find & Select

Editing

K10

Enter Dam Operation

**Dam Operation Entry**

**Wildwood Dam**

Date (YYYYMMDD) Time (HHMM, EST) GO 1 (ft) GO 2 (ft) GO 3 (ft) GO 3 (ft) VO 1 (%) VO 2 (%) VO 3 (%)

YYYYMMDD HHMM

OK Cancel

**Fanshawe Dam**

Date (YYYYMMDD) Time (HHMM, EST) GO 1 (ft) GO 2 (ft) GO 3 (ft) GO 4 (ft) GO 5 (ft) GO 6 (ft) Hydro (%) BP Valve (%)

YYYYMMDD HHMM

OK Cancel

**Pittcock Dam**

Date (YYYYMMDD) Time (HHMM, EST) GO 1 (ft) GO 2 (ft) GO 3 (ft) GO 4 (ft) GO 5 (ft) VO 1 (%)

YYYYMMDD HHMM

OK Cancel

Done! Cancel

Sheet1 Sheet2 Sheet3

Ready 10%



# Snow Survey Data

UT\_Snow\_Data.xls [Compatibility Mode] - Micro

File Home Insert Page Layout Formulas Data Review View Developer

Cut Copy Paste Format Painter Clipboard Font

G20 fx

A B C D

1

2

3

4 Add New Data

5 Print Summary

6 Create PDF

7 Create CSV

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

Main MNR Summary StrDa

Ready

UTRCA Snow Survey Data Input

Station Name	Snow Depth (cm)	Weight (g)	Crust Condition	Ground Condition
Bornholm	0	.	n/a	UW
Fullarton	0	.	n/a	UW
Rostock	0	.	n/a	UW
Kirkton	0	.	n/a	UW
Wildwood	0	.	n/a	UW
Highway 7	0	.	n/a	UW
Observatory	0	.	n/a	UW
Fanshawe	0	.	n/a	UW
Embro	0	.	n/a	UW
Woodstock	0	.	n/a	UW
Foldens	0	.	n/a	UW
Kintore	0	.	n/a	UW
Sebringville	0	.	n/a	UW
Tavistock	0	.	n/a	n/a

Update Database Done!

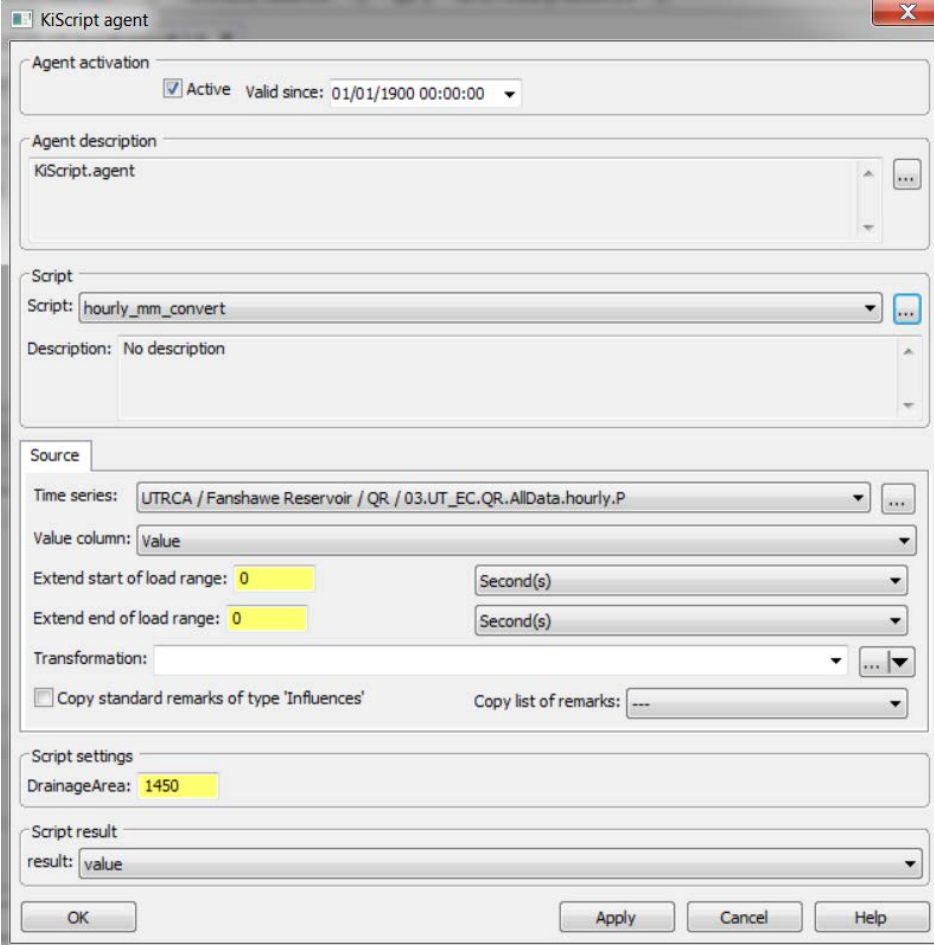
☒ Metric ☐ Imperial

☒ Distribute Tavistock?

☐ Supplemental Survey?

Survey Date (MM/DD/YYYY) 09/14/2018

# Hourly Runoff Depth Calculation, QB (mm)

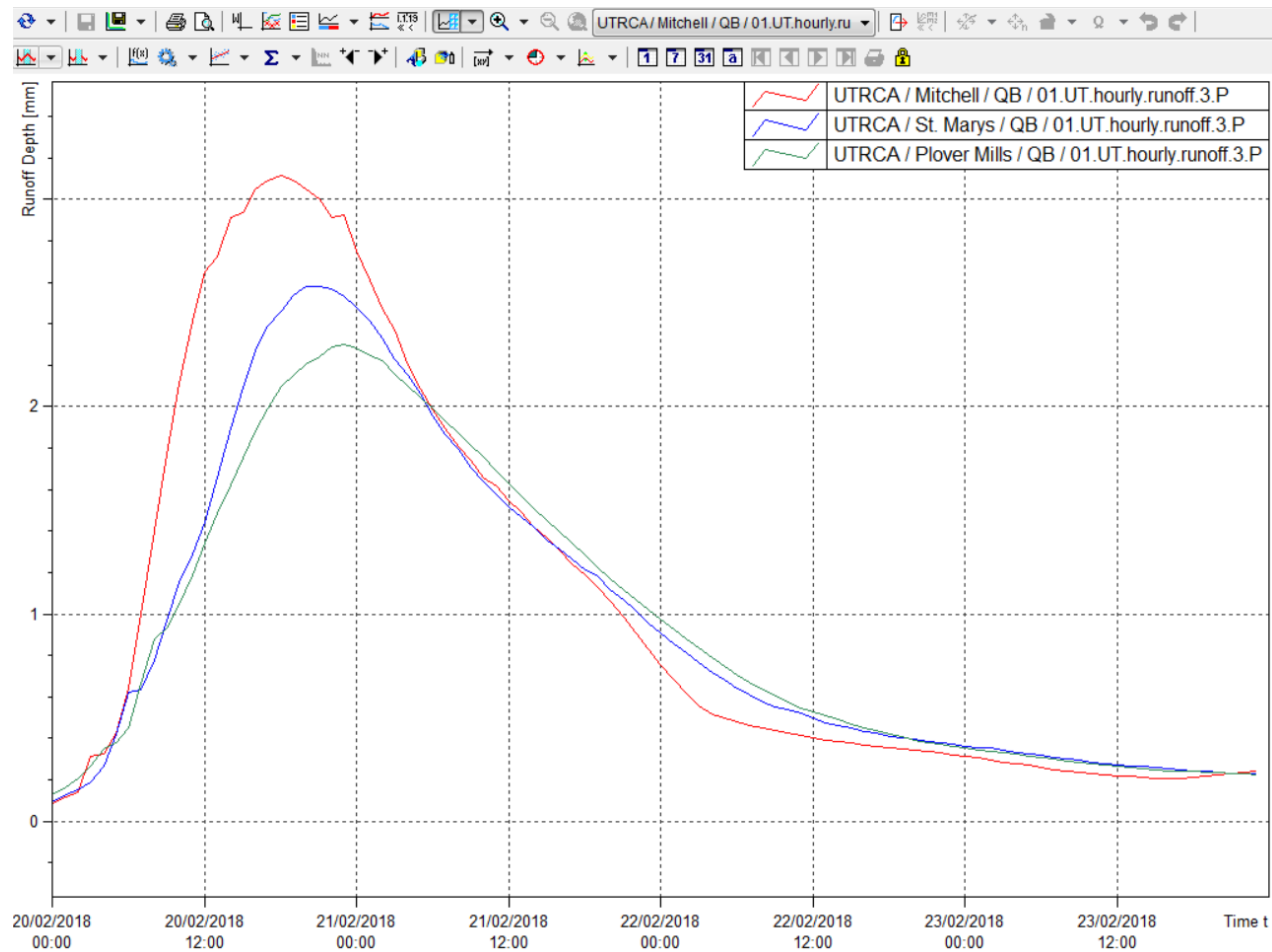


The image shows a screenshot of the 'KiScript agent' configuration window. The window is titled 'KiScript agent' and has a standard Windows-style title bar with a close button. It contains several sections for configuring the agent's behavior:

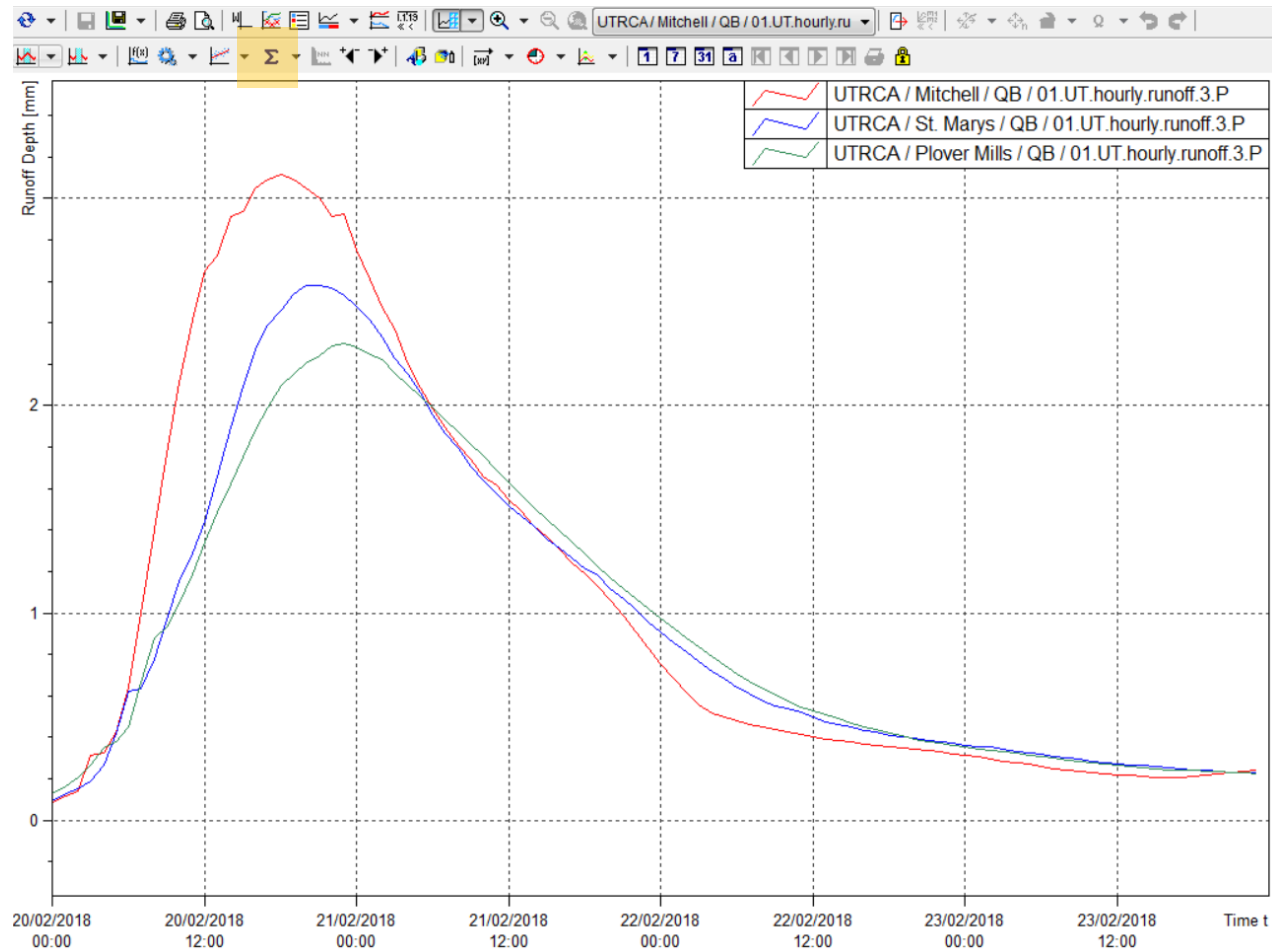
- Agent activation:** A checkbox labeled 'Active' is checked. Below it, 'Valid since: 01/01/1900 00:00:00' is displayed with a dropdown arrow.
- Agent description:** A text box contains 'KiScript.agent'.
- Script:** A dropdown menu shows 'hourly\_mm\_convert'. Below it, 'Description: No description' is shown.
- Source:** This section contains several fields:
  - 'Time series:' dropdown showing 'UTRCA / Fanshawe Reservoir / QR / 03.UT\_EC.QR.AllData.hourly.P'.
  - 'Value column:' dropdown showing 'Value'.
  - 'Extend start of load range:' text box with '0' and a 'Second(s)' dropdown.
  - 'Extend end of load range:' text box with '0' and a 'Second(s)' dropdown.
  - 'Transformation:' dropdown.
  - A checkbox 'Copy standard remarks of type 'Influences'' is unchecked.
  - 'Copy list of remarks:' dropdown showing '---'.
- Script settings:** A text box shows 'DrainageArea: 1450'.
- Script result:** A dropdown menu shows 'result: value'.

At the bottom of the window are four buttons: 'OK', 'Apply', 'Cancel', and 'Help'.

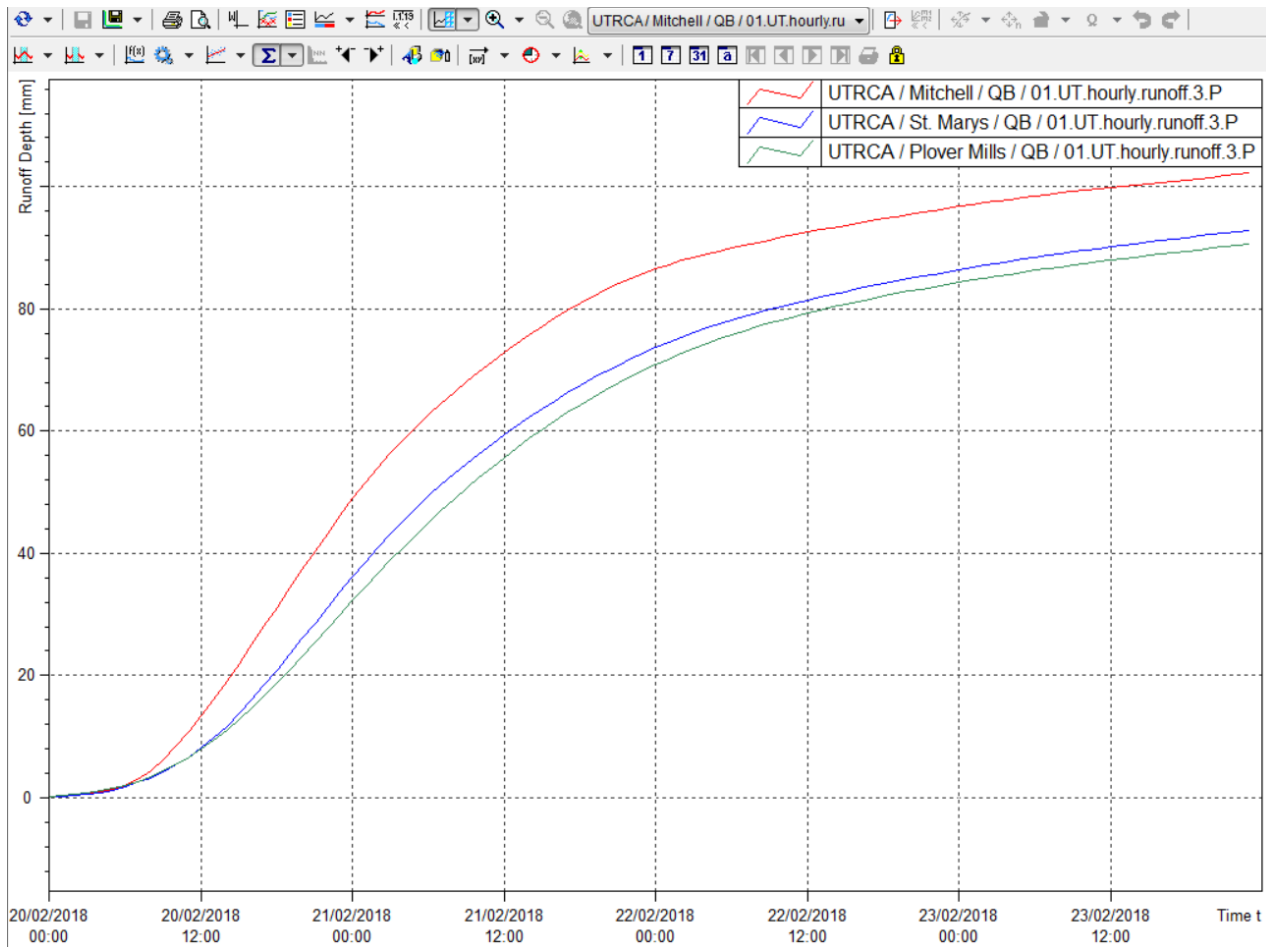
# Hourly runoff plotting



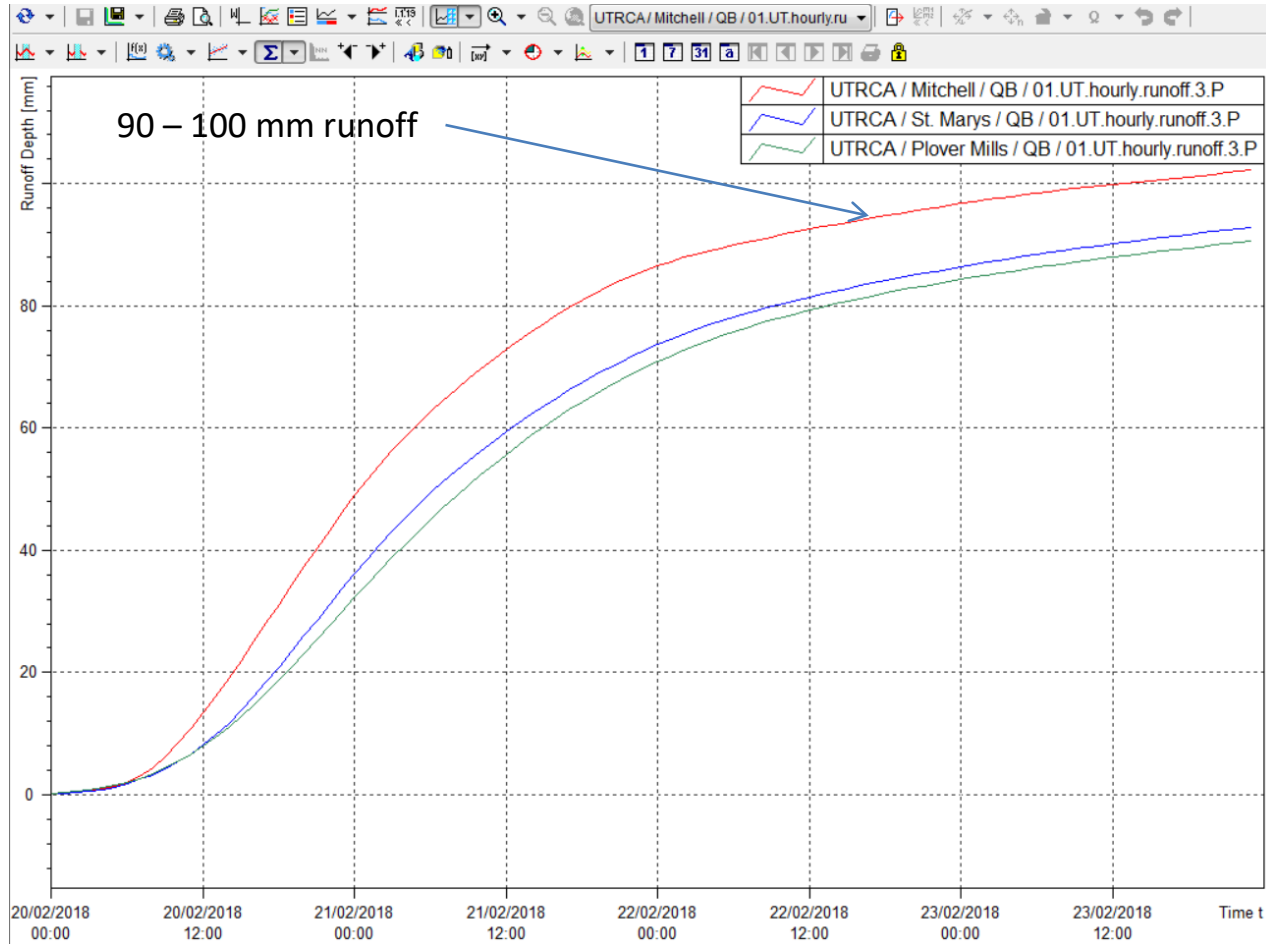
# Hourly runoff plotting



# Hourly runoff plotting

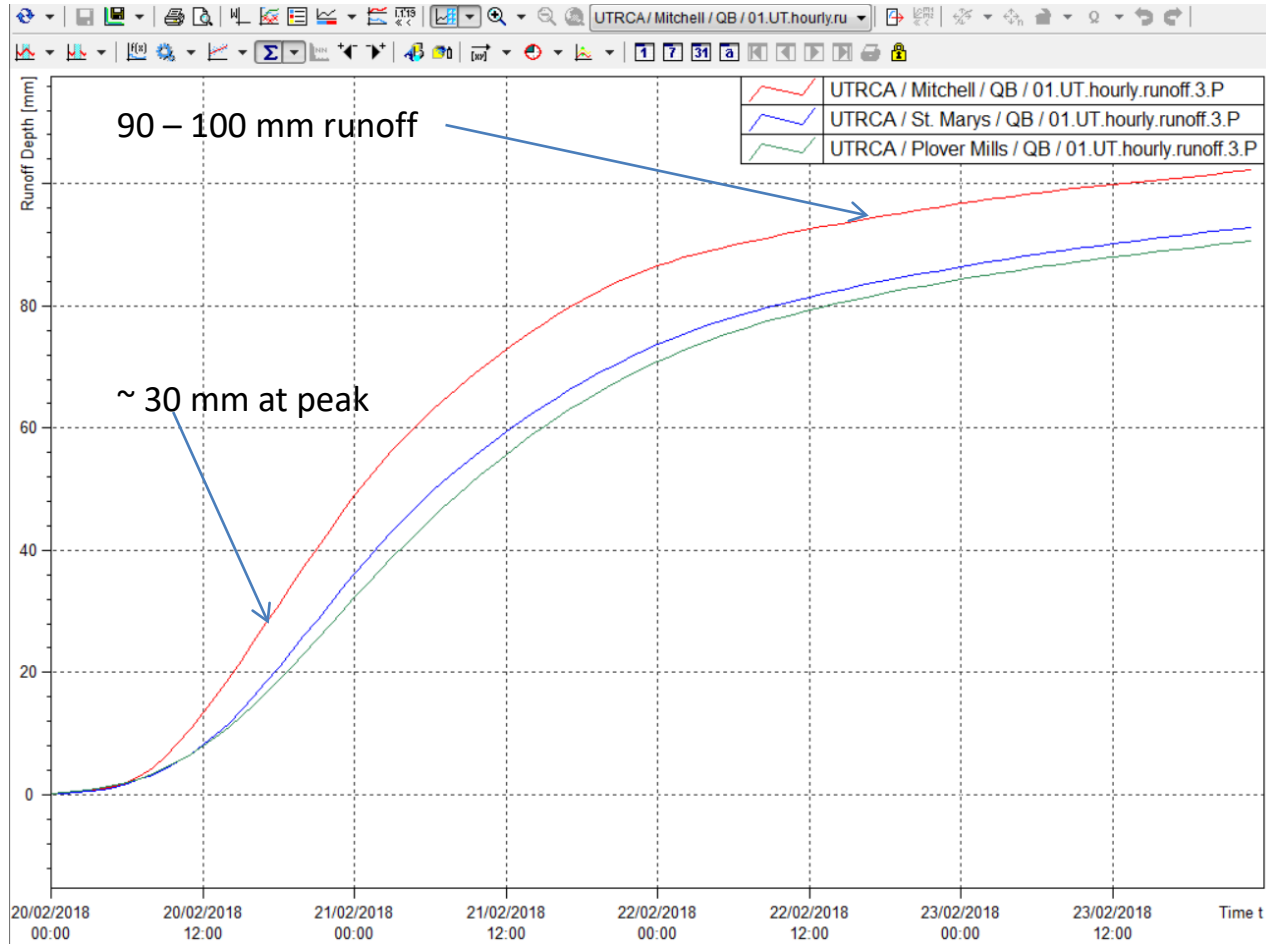


# Hourly runoff plotting

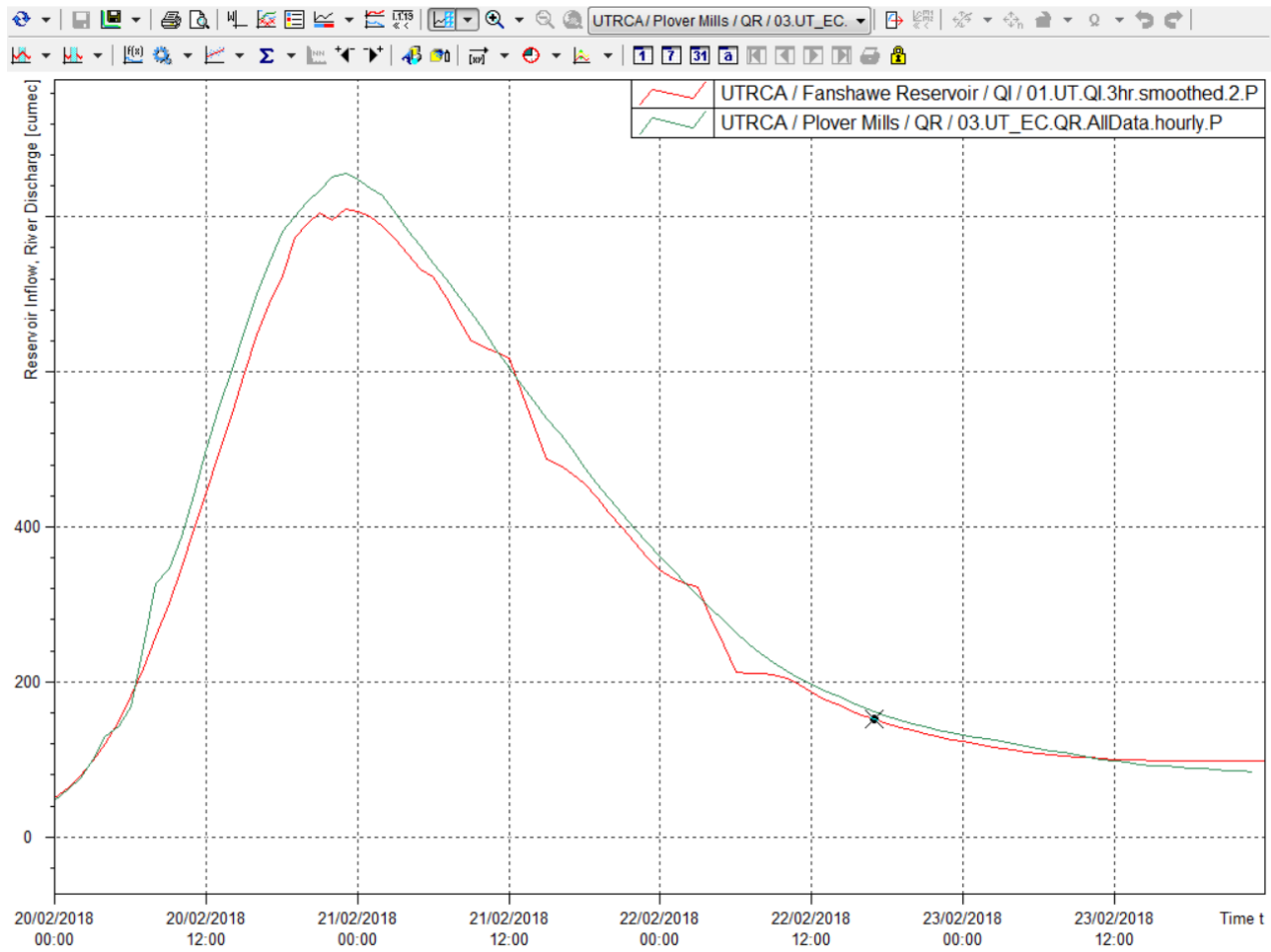




# Hourly runoff plotting

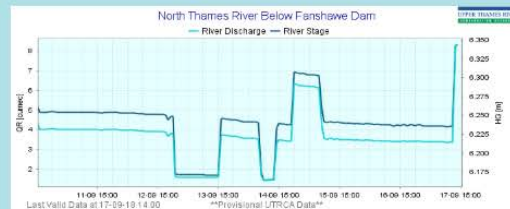
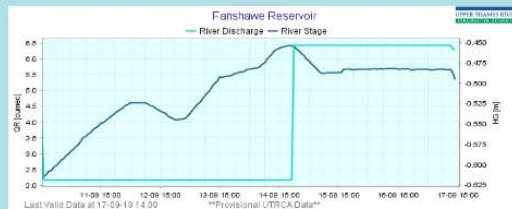
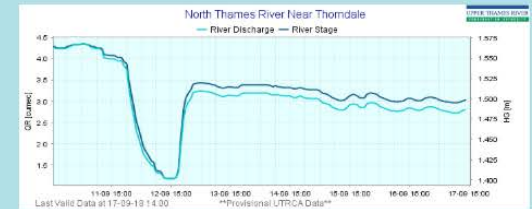
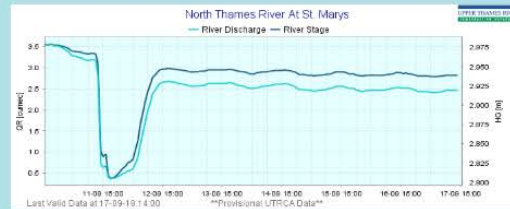
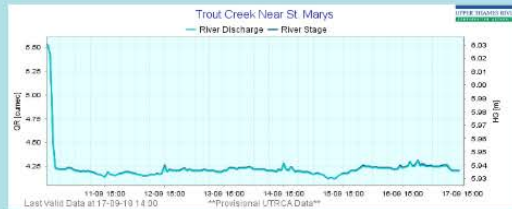
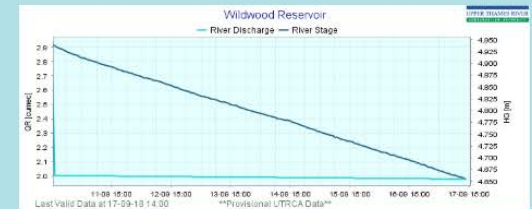
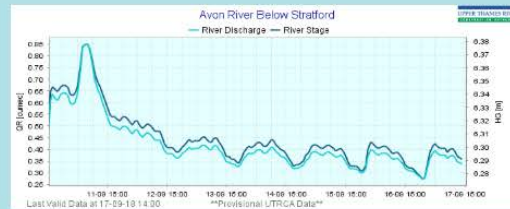
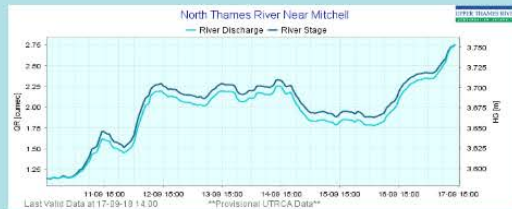


# Reservoir backrouting



# kiWIS data plots

[7 Day UTRCA QR and HG Hourly Plots, \*\*Only works in the office now\*\*]



# Questions?

- Thanks!
- Laura Flynn, Water Management Data Specialist
  - [flynnl@thamesriver.on.ca](mailto:flynnl@thamesriver.on.ca)
  - 519.451.2800 x 423
- Mark Helsten, Sr. Water Resources Engineer
  - [helstenm@thamesriver.on.ca](mailto:helstenm@thamesriver.on.ca)
  - 519.451.2800 x 241