Better understanding the hydrology of peri-urban ephemeral pools that are habitats for the Western Chorus Frog

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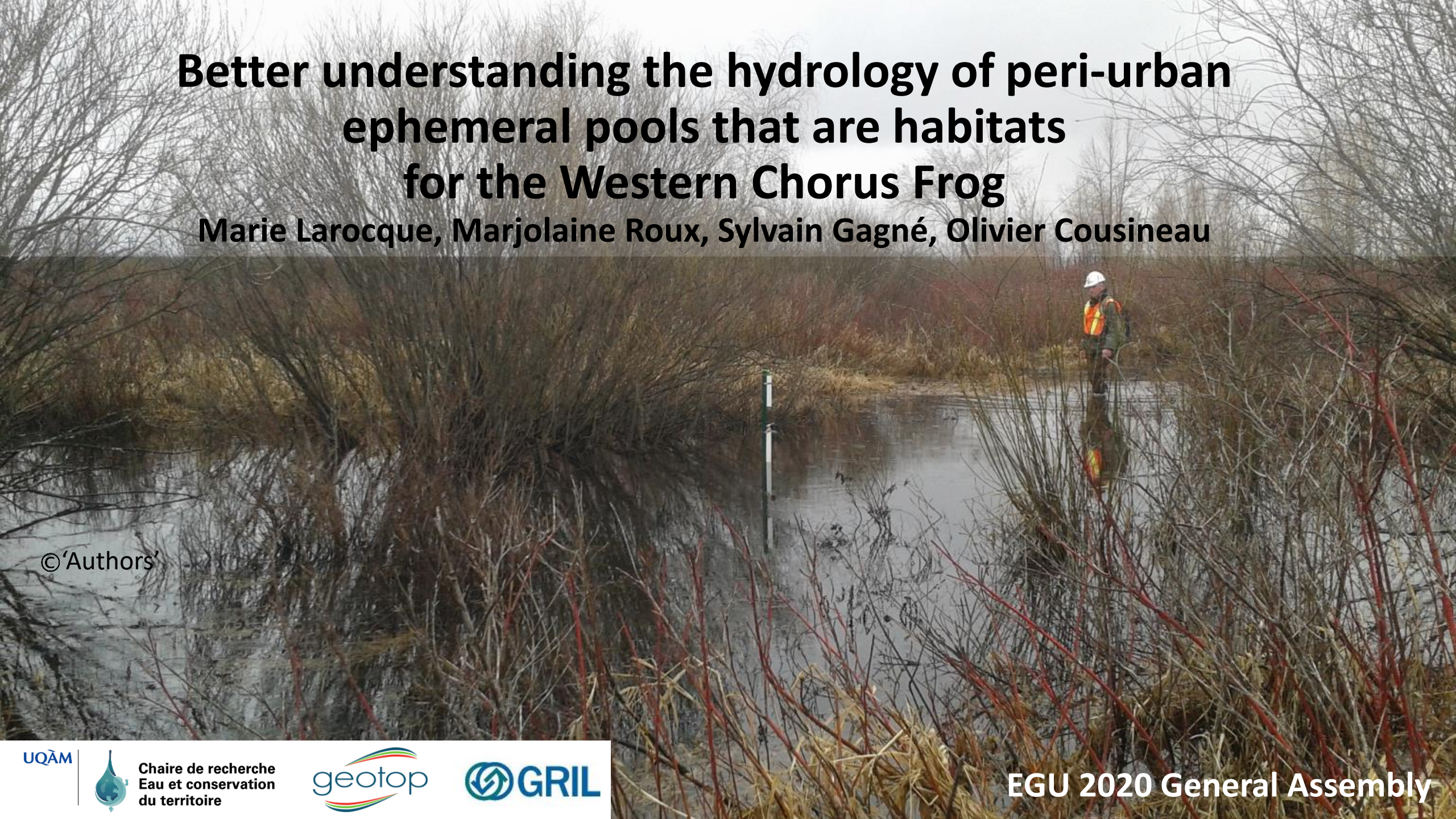

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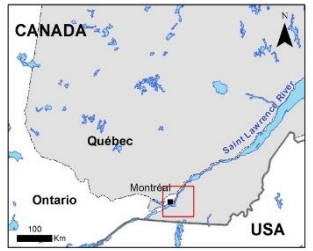
Context and objectives

- **Ephemeral (vernal) pools = small hydrologically isolated wetlands;**
- **Breeding habitats for amphibians during their spring and early summer period of hydrological activity;**
- **Small and intermittent = how to protect their hydrology from human activities and climate change;**
- **In peri-urban areas around Montreal City (Quebec, Canada) ephemeral pools = habitats to the endangered Western Chorus Frog.**

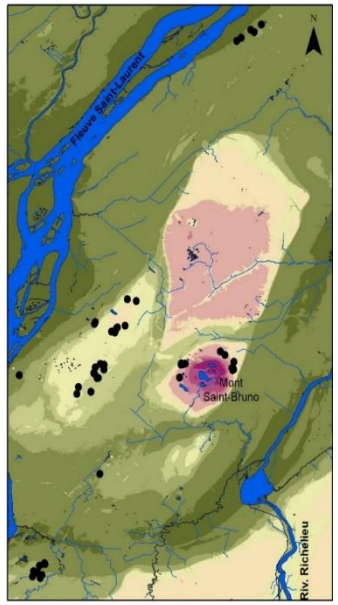
Objective

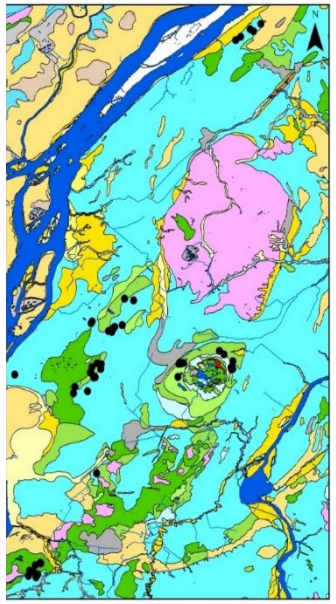
➔ Understand the processes driving pool hydrology, and especially pool hydroperiod (length of hydrologically active period after snowmelt), to better protect the remaining Western Chorus Frog population.

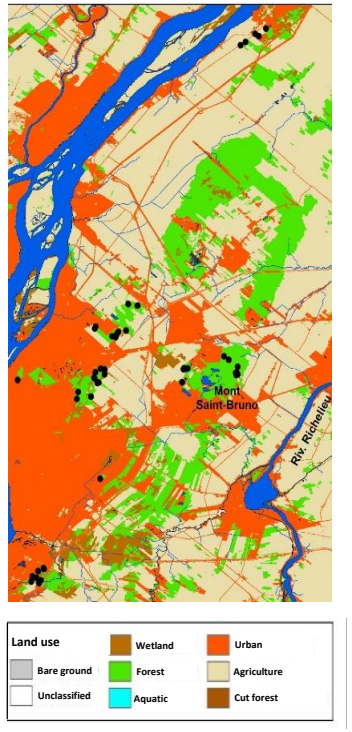
Study area



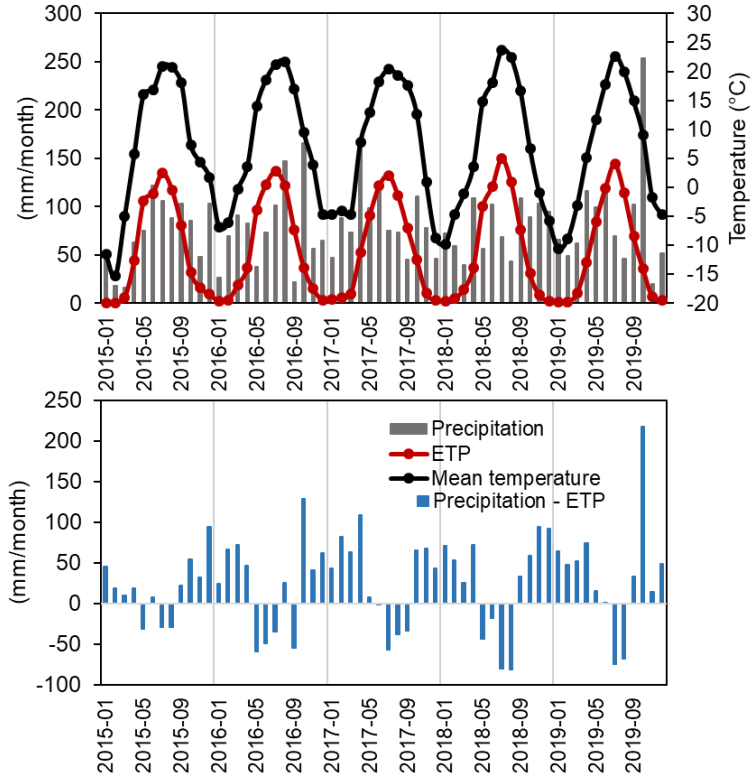
- Topography: low relief area
- Geology: clay coverage and till outcrops
- Land use: peri-urban and agriculture







- Precipitation : 1010 mm/yr
- Average T : 6.2 °C
- PET: 603 mm/yr
- T < 0 °C : December-March
- Snowmelt: April

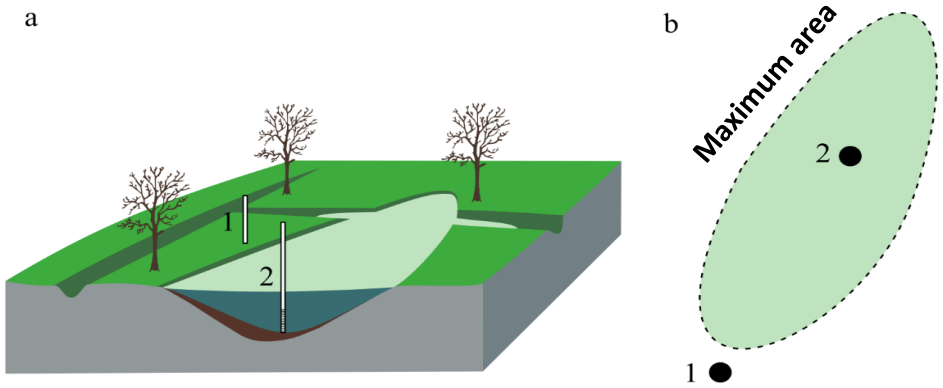


Methods

- 48 pools monitored 2016-2019
- 7 pools fully characterized
- Topography and bathymetry: total station
- Drainage areas: LiDAR, areal photographs
- Geology: sampling on transects
- 12 climate change scenarios RCP4.5 & RCP8.5

(1981-2010, 2041-2070, 2071-2100)

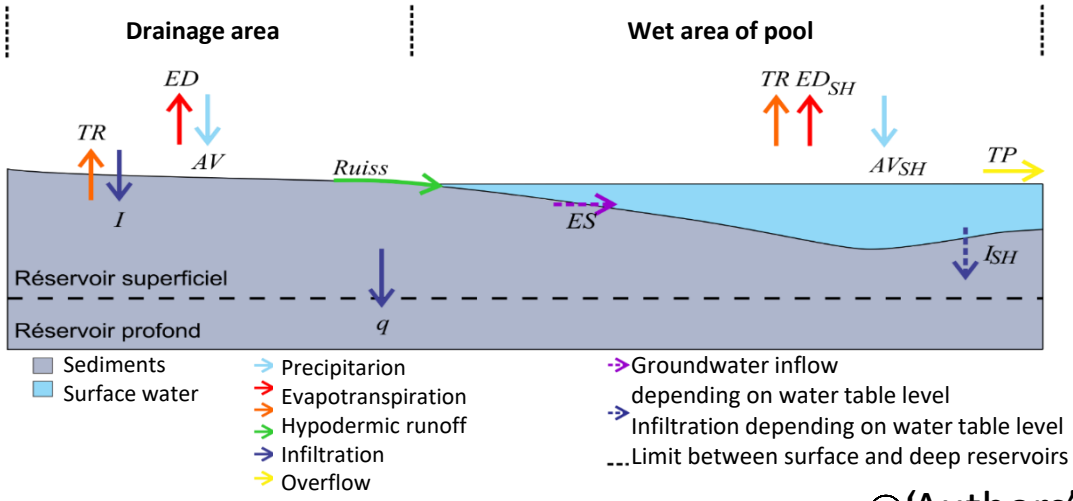
Site instrumentation



Measurements and characterization

Measurement	48 vernal pools	7 characterized sites
Water level monitoring	X	X
Maximum water level	X	X
Groundwater level monitoring		X
Vernal pool bathymetry		X
Drainage area	X	X
Geology		X
Length of hydroperiod	X	X

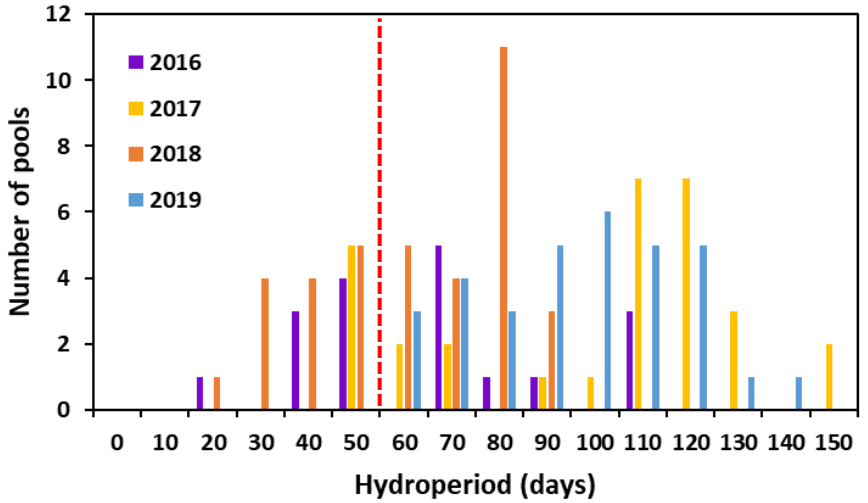
Water budget model



Results

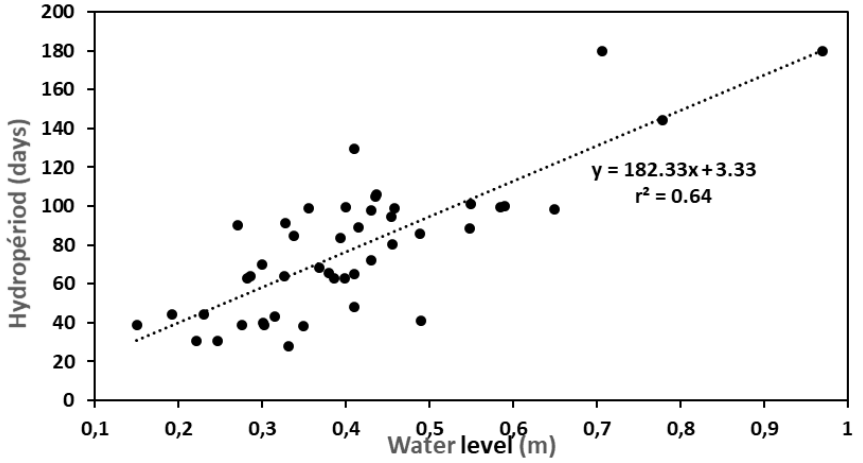
Hydroperiods

- Vary from year to year and between ponds;
- Are generally longer than the 50 days needed for frog development (doted red line);
- Are longer in the deeper ponds.



Pool hydrology

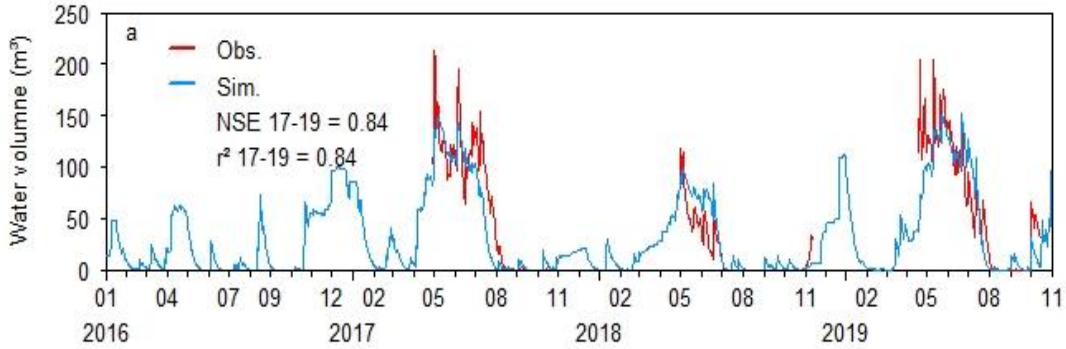
- Is driven by precipitation and runoff;
- Involves limited gw inflow;
- Is driven by gw levels (pressure control).



Results

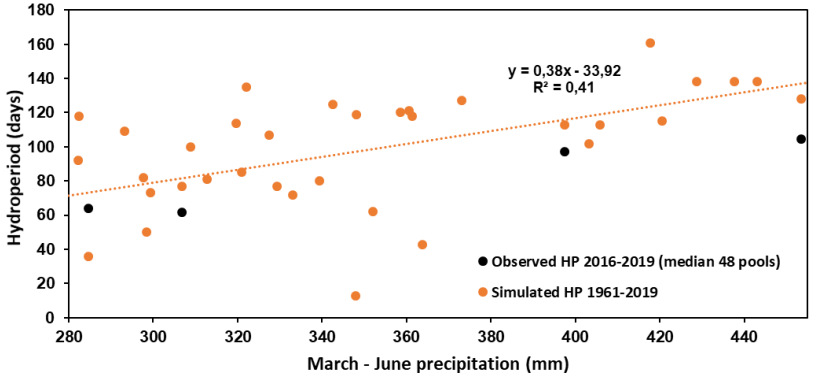
Recent conditions (2016-2019)

- The water budget model simulates well the dynamics of pool hydrology,



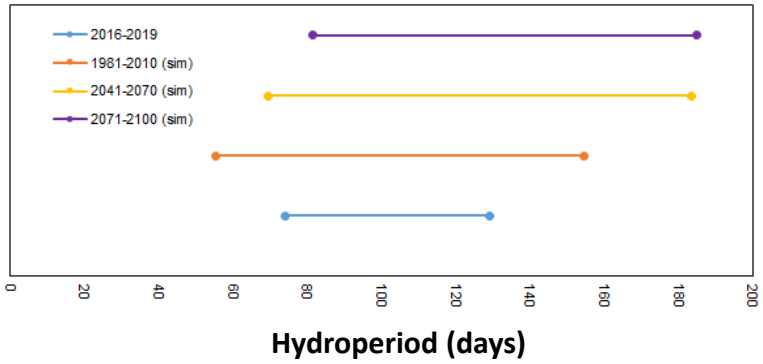
Past HP (1961-2015)

- Vary between 15 and 120 days;
- Increase with March-June precipitation.



Future HP

- Will be longer (increased precipitation)
- Will start earlier (warmer winter)



Summary and outlook

Summary of observations

- Hydroperiods vary markedly from year to year and between pools;
- Hydroperiods are influenced by pool morphology, spring precipitation and water table position.

Protecting ephemeral pool hydrology should involve

- Not modifying runoff conditions;
- Maintaining groundwater levels;
- Protect in priority the deeper pools.

Future work

- Implement long-term hydrological monitoring of targeted pools;
- Simulate hydrological connections with surface and groundwater flows.