Testing the Global Surface Water Dataset for Canada

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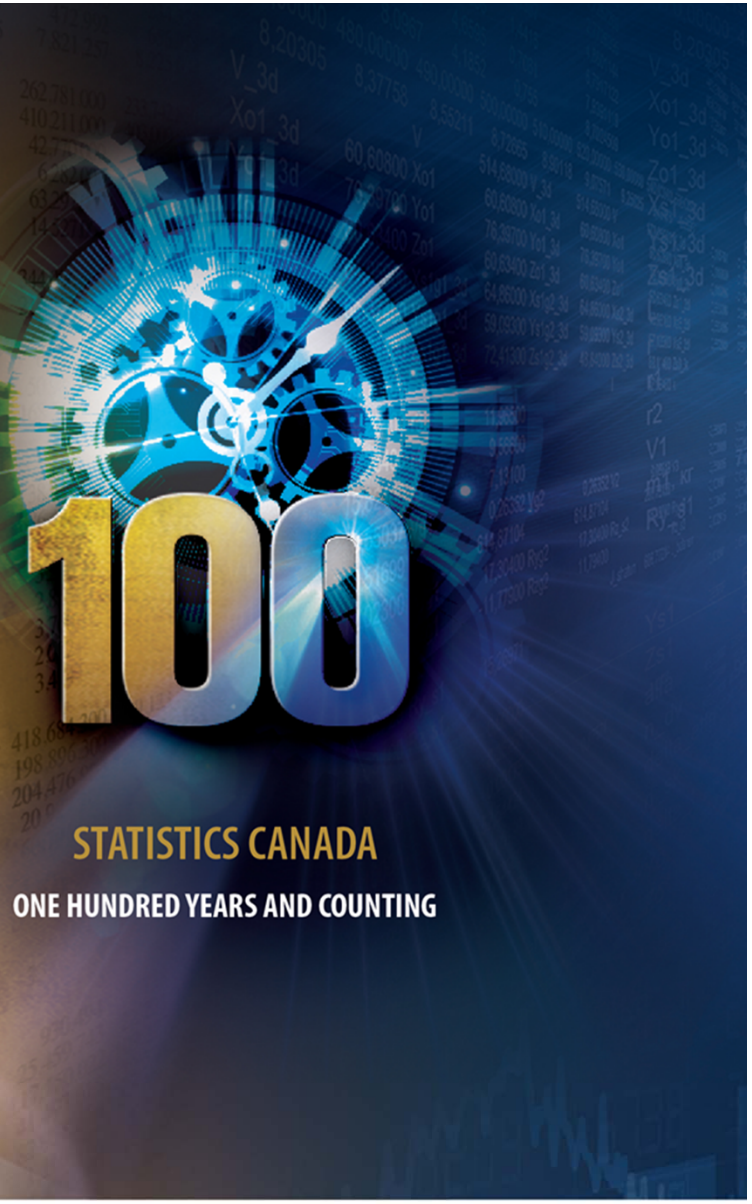
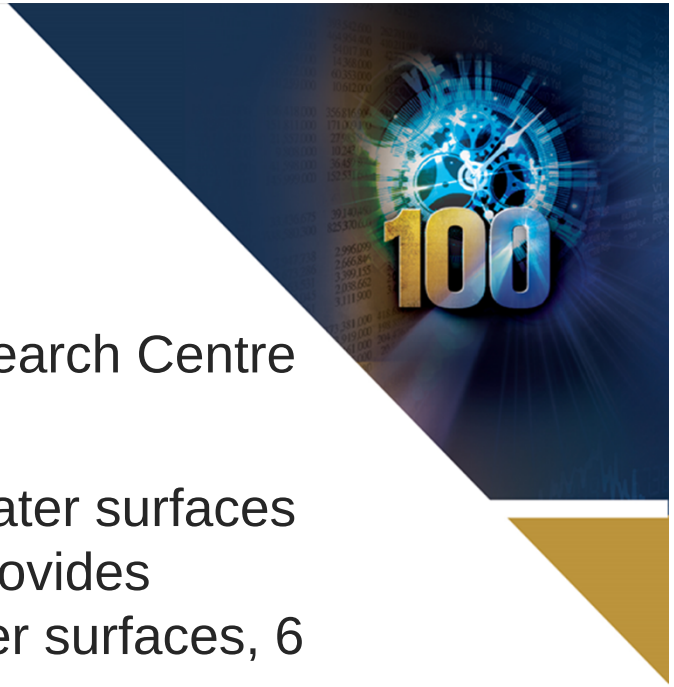


Forum of Experts in SEEA Experimental Ecosystem Accounting 2018
Glen Cove, New York.
June 2018

Global Surface Water (GSW)



- Produced by European Commission's Joint Research Centre

- Maps the location and temporal distribution of water surfaces at the global scale over the past 32 years and provides statistics on the extent and change of those water surfaces, 6 layers:
  1. Water Occurrence (1984-2015)
  2. Water Occurrence Change Intensity (1984-1999 to 2000-2015)
  3. Water Seasonality (2014-2015)
  4. Annual Water Recurrence (1984-2015)
  5. Water Transitions (First year to Last Year)

Purpose of the exercise

1. Measure the indicator SDG 6.6.1 based on the UN SDG methodology and the GSW

2. Assess the indicator for quality
    1. accurately measures change in extent
    2. captures and misses
    3. Informing on goal, target and indicator questions/objectives

3. Present alternative(s), preferences and limitations

SDG Indicator 6.6.1:

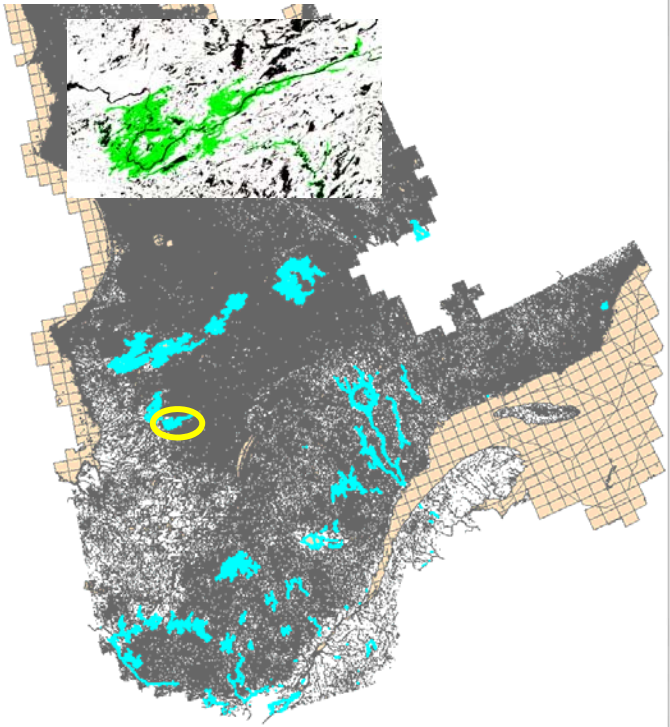
- **Target 6.6: By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes**
  - *2020 synchronizes with the Aichi Biodiversity Targets of the CBD but will continue beyond that date to synchronise with the rest of the 2030 Agenda.*
- **Indicator 6.6.1: Percentage of change in water-related ecosystems extent over time.**
  - *Their spatial extent*
  - *The quantity of water contained within these ecosystems*
  - *The health or state of these ecosystems*

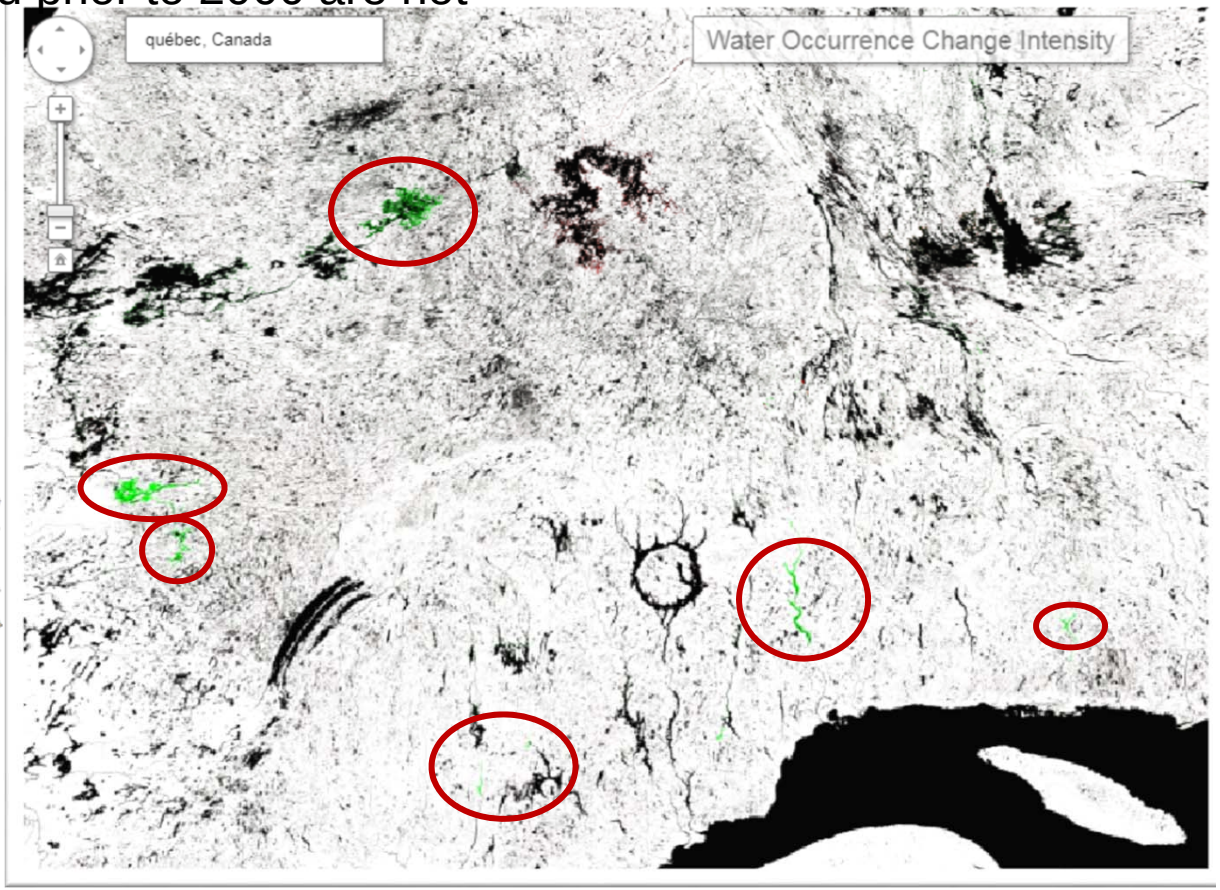
UNEP

Measuring extent

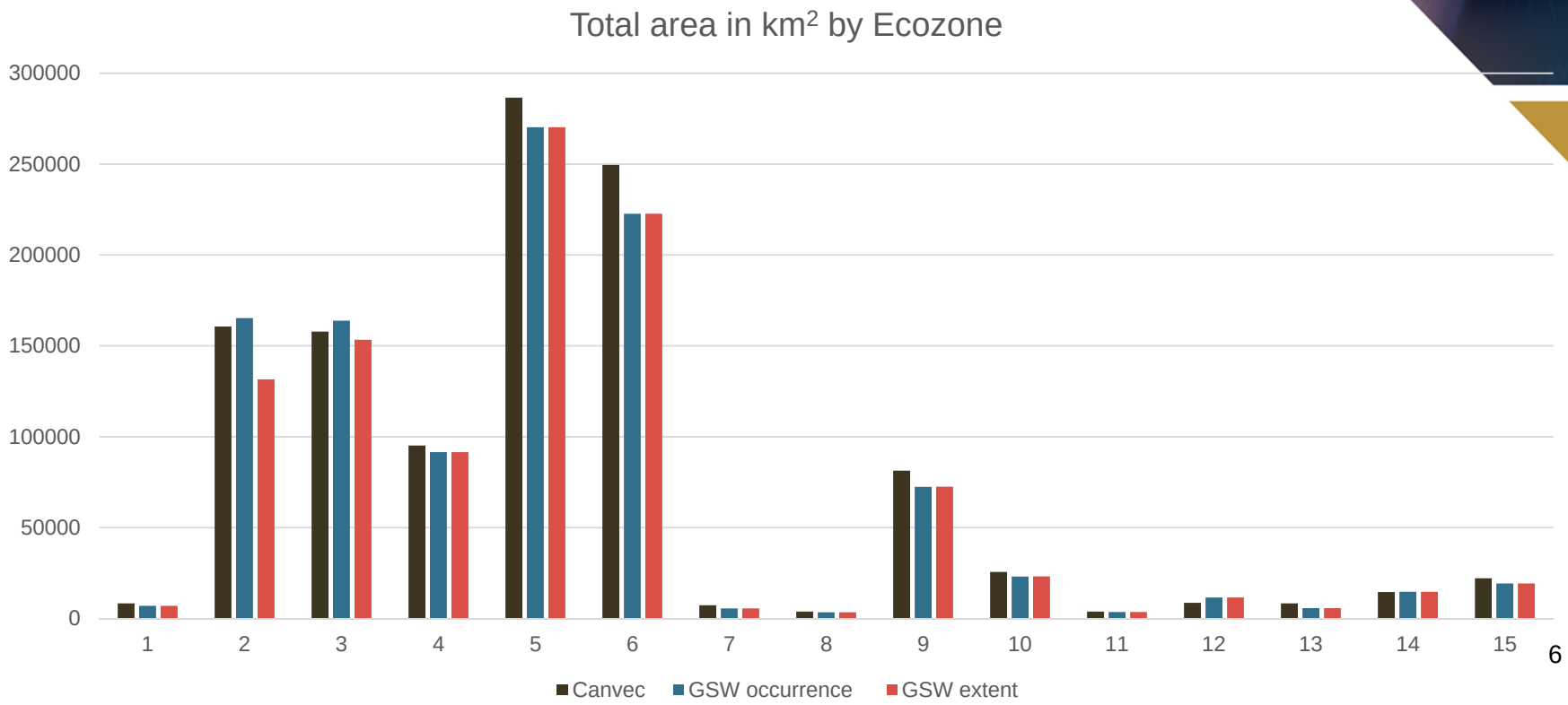
- In this example, the GSW captured well the 7 hydro-electric reservoirs built after the year 2000

- However, all of those created prior to 2000 are not identified.



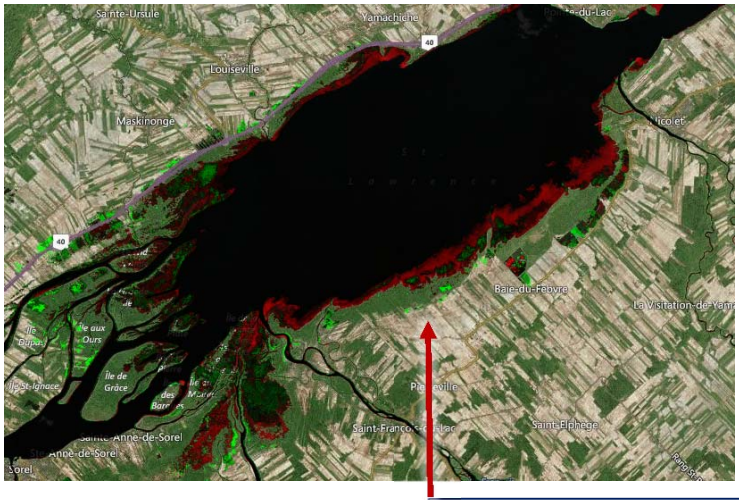


Comparison between Global Surface Water – Maximum extent and Canadian Hydrographic layer – water body (Canvec – **1:50 000**)



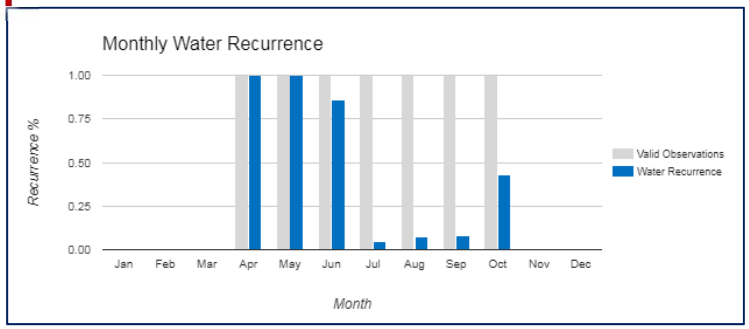
Measuring change

GSW <u>occurrence change intensity</u> identified water decrease (red) in Lac Saint-Pierre, St. Lawrence river

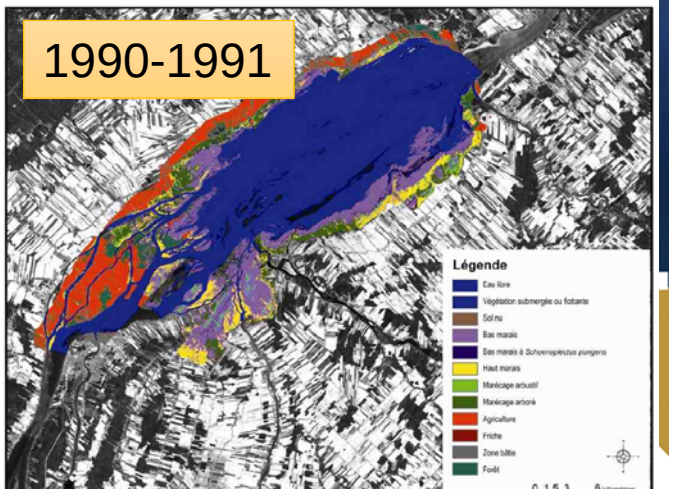


- The GSW – decrease area was compared to the Wetland maps produced by Environment and Climate Change Canada for the same time periods.
- The wetland maps show low marshes (purple) where GSW has identified water decrease
- Marshes are periodically or permanently flooded, there are no or few trees and bushes, and in season vegetation can be seen above water.

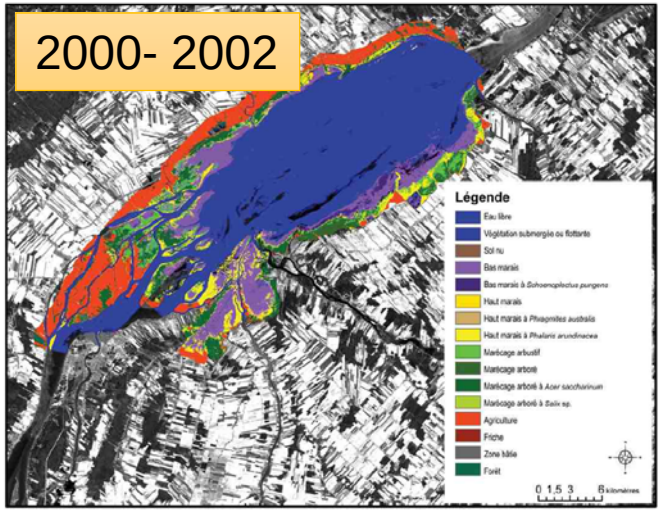
Differences between all homologous pairs of months were averaged to create the surface water occurrence change intensity map



Milieux humides du lac Saint-Pierre en 1990-1991



Milieux humides du lac Saint-Pierre en 2000-2002

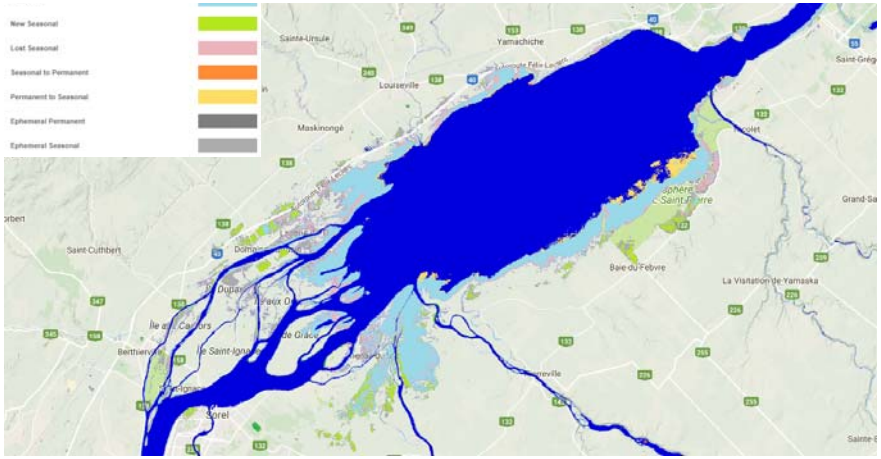


Source: Jean, Martin, et Guy Létourneau. 2011. *Changements dans les milieux humides du fleuve Saint-Laurent de 1970 à 2002*, Environnement Canada, Direction générale des sciences et de la technologie, Monitoring et surveillance de la qualité de l'eau au Québec, Rapport technique numéro 511, 302 pages.

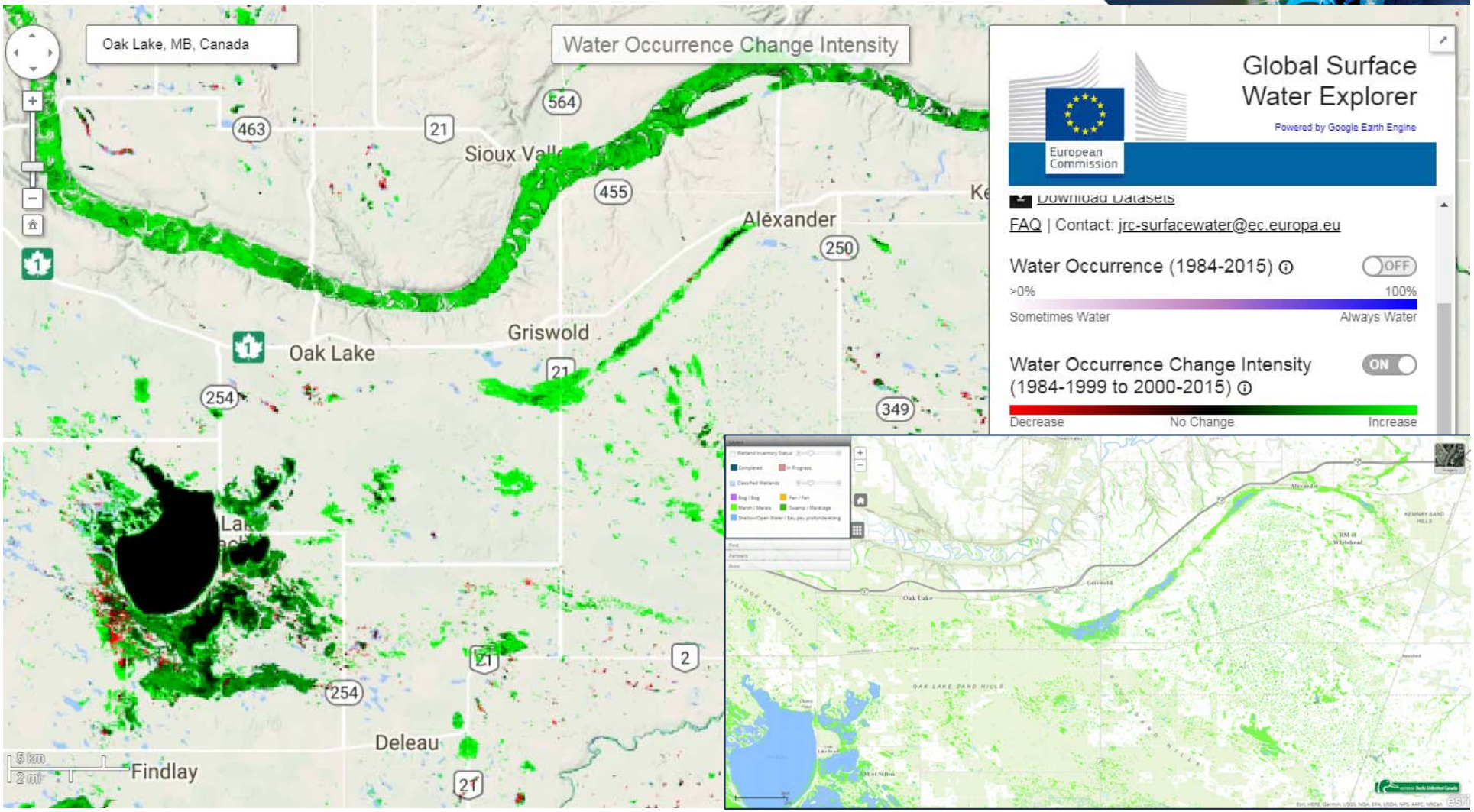
Transition and Recurrence layers

- Transition and Recurrence layers are showing the same pattern as the Occurrence Change Intensity although they were not derived the same way.
  - Transition layer indicates that permanent water has become seasonal
  - Recurrence layer indicates that water is low recurrence

- Based on those results, we recommend to add sampling sites in low marshes to capture the signal associated to water with emergent vegetation.
  - This seasonal effect of vegetation floating on water should be integrated in the model to be mapped as water



Measuring change



GSW - Pros

1. The methodology is robust, transparent, very detailed
2. Free and open source: data sources as well as the scripts are available
3. The web mapping application provides:
    1. Fast and easy way to visualize the GSW layers
    2. Useful information on the monthly water recurrence and water history at pixel level
    3. Access to data download
    4. Landsat time series from 1984 to 2015 as basemap
4. The Occurrence and Maximum extent layers provide information on water on an annual basis from 1984 to 2015
5. The Water Occurrence layer:
    - can contribute to the improvement of wetland identification (marsh and swamp)
    - could be used as reference for permanent water extent with the identification of the threshold (~75% occurrence)

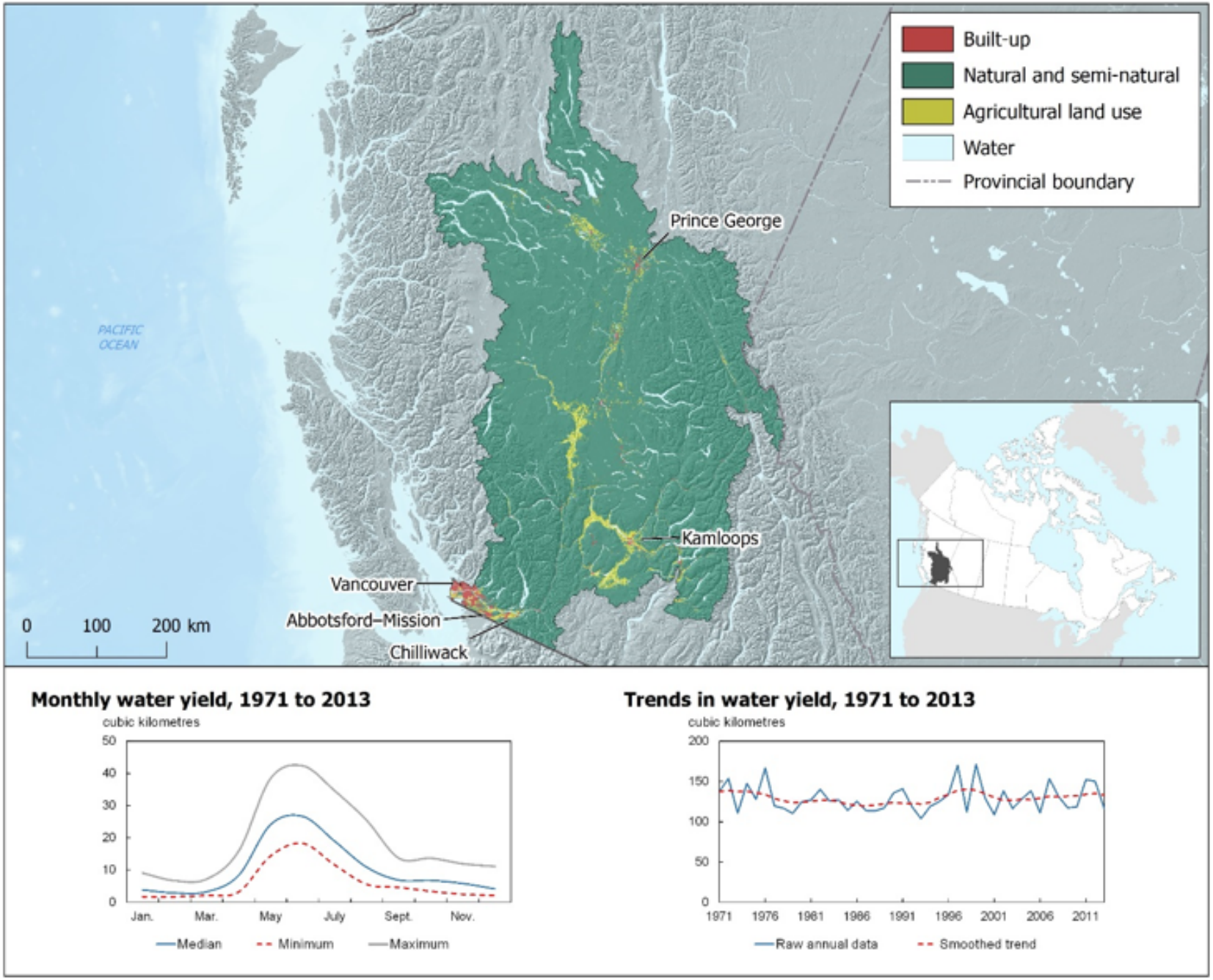
Canada

GSW - challenges

There are important limitations with the results relative to SDG 6.6.1– mainly because of spatial and temporal resolution issues.

1. The datasets do not include most streams, many small rivers, wetlands and ponds
2. The time scale is limited - especially when considering the objective is to measure meaningful change.
    1. In most cases a thirty year time series is insufficient.
3. Important surface water characteristics we would like to see measured are not measured well – changes in frequency, magnitude, timing and overall variability.
4. The results from GSW alone are limited for answering questions related to real change in freshwater ecosystems, and should be considered alongside other important datasets when analysing the data
    1. E.g. temperature, precipitation, land cover change

Map 3.3.2
Land use and water yield for the Fraser–Lower Mainland drainage region



Conclusion

1. Use of the Google Earth engine with GSW is a very positive step forward and leveraging this tool will be very beneficial

2. GSW, and other EO global datasets, is a key part of making progress on land, water and ecosystem accounts

3. The most important aspect to emphasize is the need to integrate Google Earth tool and EO data with other tools and other results from other data sources
   - Drawing conclusions from one product alone may not reflect reality meaningfully

Canada

THANK YOU!

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