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# How to monitor a large-scale surface-flow constructed wetland with minimal disturbance?

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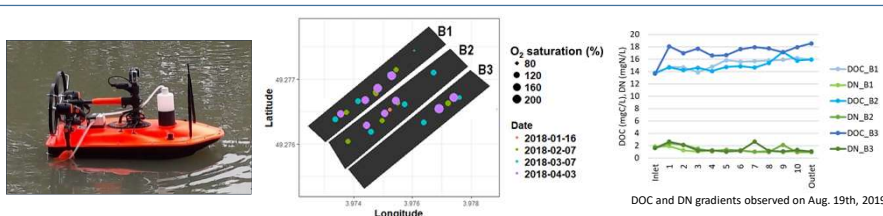
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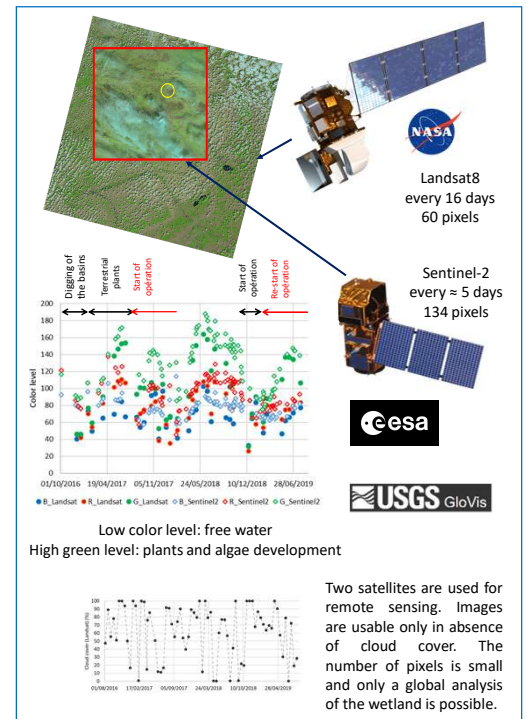
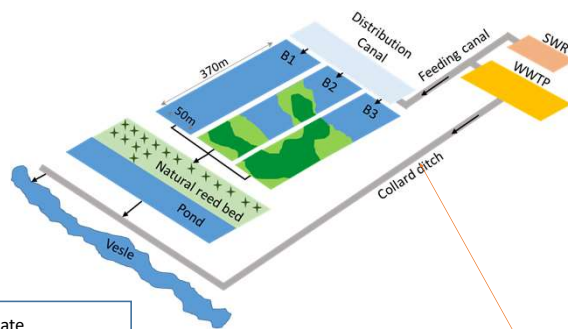
The AZHUREV surface-flow constructed wetland is a large-scale demonstration wetland built at the outlet of the Grand Reims (France) wastewater treatment plant (WWTP). Three 20,000 m<sup>2</sup> basins (rectangular shape with different depth distribution within each basin) have been created: the initial vegetation (mainly *P. australis*, *S. lacustris* and *G. maxima*) density was also different in each basin. Their aim is to polish a part of the treated wastewater (250 m<sup>3</sup>/h) from the Grand Reims WWTP, as well as to treat part of the Grand Reims stormwater.

Flowmeters have been installed and conductivity/temperature probes have been deployed at the inlet and exit of each basin. The basic monitoring (chemical variables) of the wetland is routinely done via sampling (monthly basis).

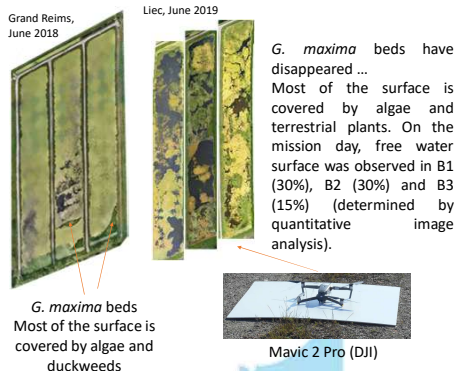
However this does not provide information on the spatial distribution of the pollution in the basins, or of temperature and dissolved oxygen. Photographs are routinely taken from the shore but, due to the size of the basins, they do not provide detailed information on the development of the vegetation.



An aquatic drone (Spyboat™ by CT2MC, Le Bourget-du-Lac, France) which is remotely driven from the shore. It is fitted with a dissolved oxygen probe and a temperature sensor to collect data 10 cm below the surface. It can also collect liquid samples by means of a peristaltic pump. The supersaturation in oxygen observed with the aquatic drone in spring is correlated with the increase of the photosynthetically active solar radiation and the development of algae in the basins. Later in the year, anaerobic zones are detected under the duckweed-covered surface. The aquatic drone is more difficult to operate when the duckweed layer is becoming thick or when the surface is frozen.



Aerial drones are used to better locate dense vegetation beds. However the number of surveys per year is limited (availability, weather conditions)



A hunting camera is used for every day monitoring. Only a part of the site can be observed (B3 and the distribution canal). Every day several images are stored by daytime and one MMS is sent.



## Final remarks:

All these devices are complementary and are helping us to monitor remotely (the wetland is 250 km away from the lab) a large wetland with minimal interference (no walking in the wetland).