

Monitoring algal blooms from space: Airthrey Loch

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The Challenge

Harmful algal blooms pose risks to public health and ecosystem integrity, and can be very costly to manage.

The ability to monitor the concentration of algae in water is of great value as this can be used to track and forecast harmful algal bloom development.

Previous work using satellite imagery to monitor algal blooms has typically focused on either marine environments, or very large inland waters.

Now, newly available daily satellite images (Planet Labs SuperDoves) may enable monitoring of much smaller water bodies than previously possible.

We used images from 2023 to re-construct the algal bloom history of a very small ($>0.1\text{km}^2$) water body on the Stirling University campus.

Analysis

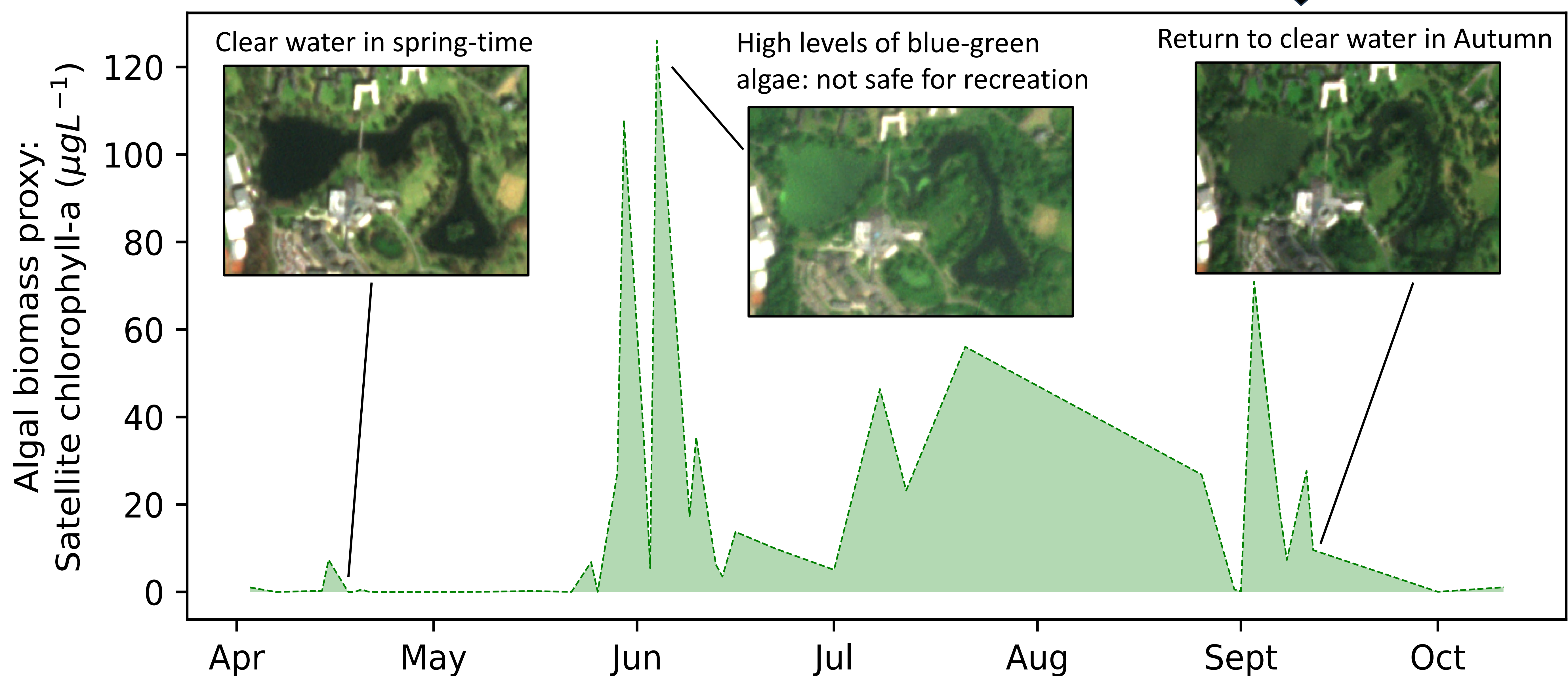
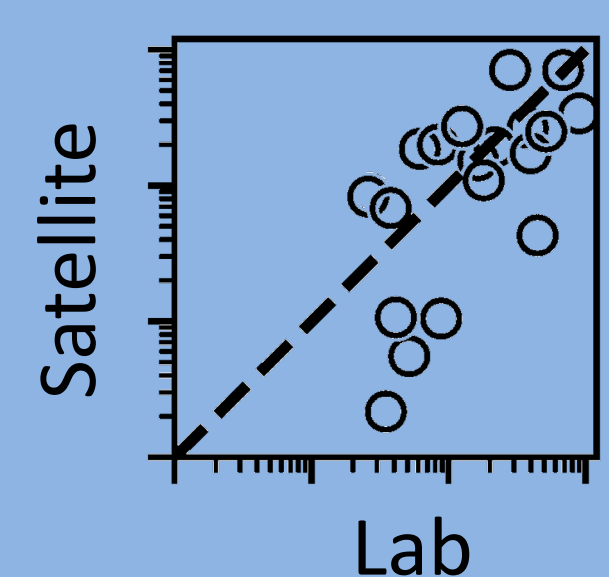
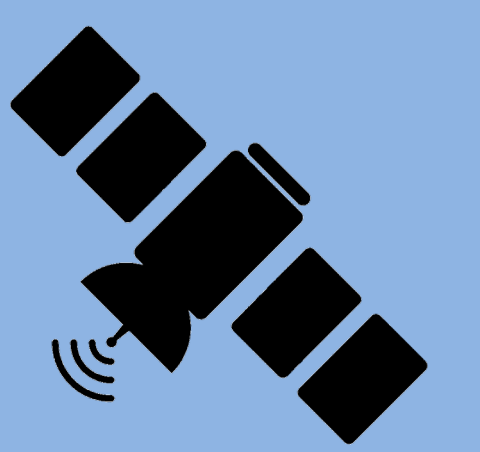
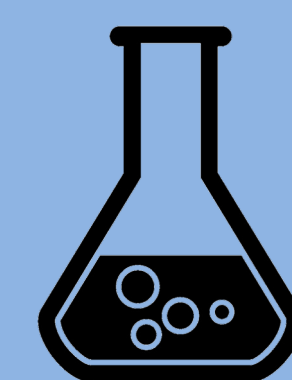
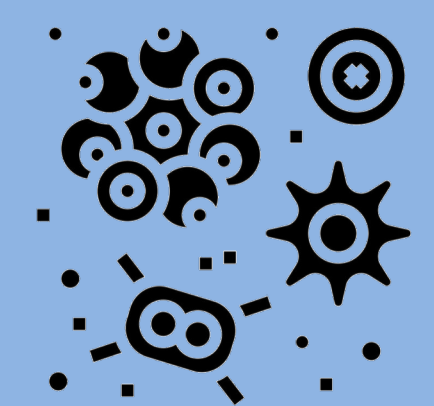
Chlorophyll-a was used as a proxy for algal biomass

Lab analyses of water samples and in-situ reflectance measurements used to calibrate NASA OC4 chlorophyll-a algorithm

ACOLITE atmospheric correction applied to satellite images, and OC4 algorithm used to retrieve chlorophyll

Fit of chlorophyll-a algorithm checked against lab analysed water samples

Chlorophyll-a time series for 2023 generated



Future Outlook

Due to climate change, it is expected that many water bodies in Scotland, and globally, will suffer from more intense and regular harmful algal blooms (CREW, 2022).

Whilst not a fully comprehensive solution, the enhanced monitoring capability that satellite imagery offers will likely prove vital in furthering our understanding and ability to manage, mitigate, and hopefully prevent harmful algal blooms.

- Satellite data courtesy of Planet Labs: www.planet.com
- ACOLITE atmospheric correction procedures: <https://github.com/acolite/acolite>
- CREW 2022: 'Assessing climate change impacts on the water quality of Scottish standing waters' <https://www.crew.ac.uk/publications>