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Long term changes in nitrogen in Cumbrian lakes

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Contemporary management issues in the Lake District are partly a product of history and may be linked to large scale environmental change.

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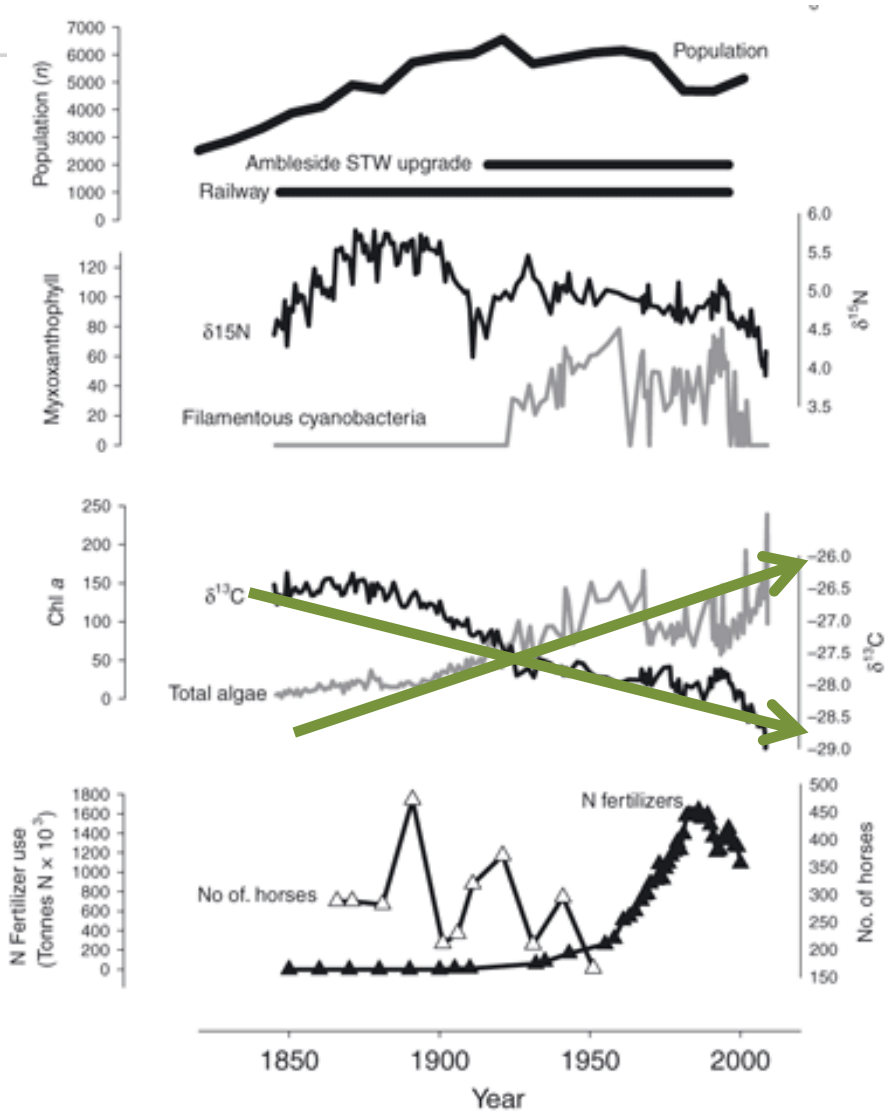
Lake sediments as archives

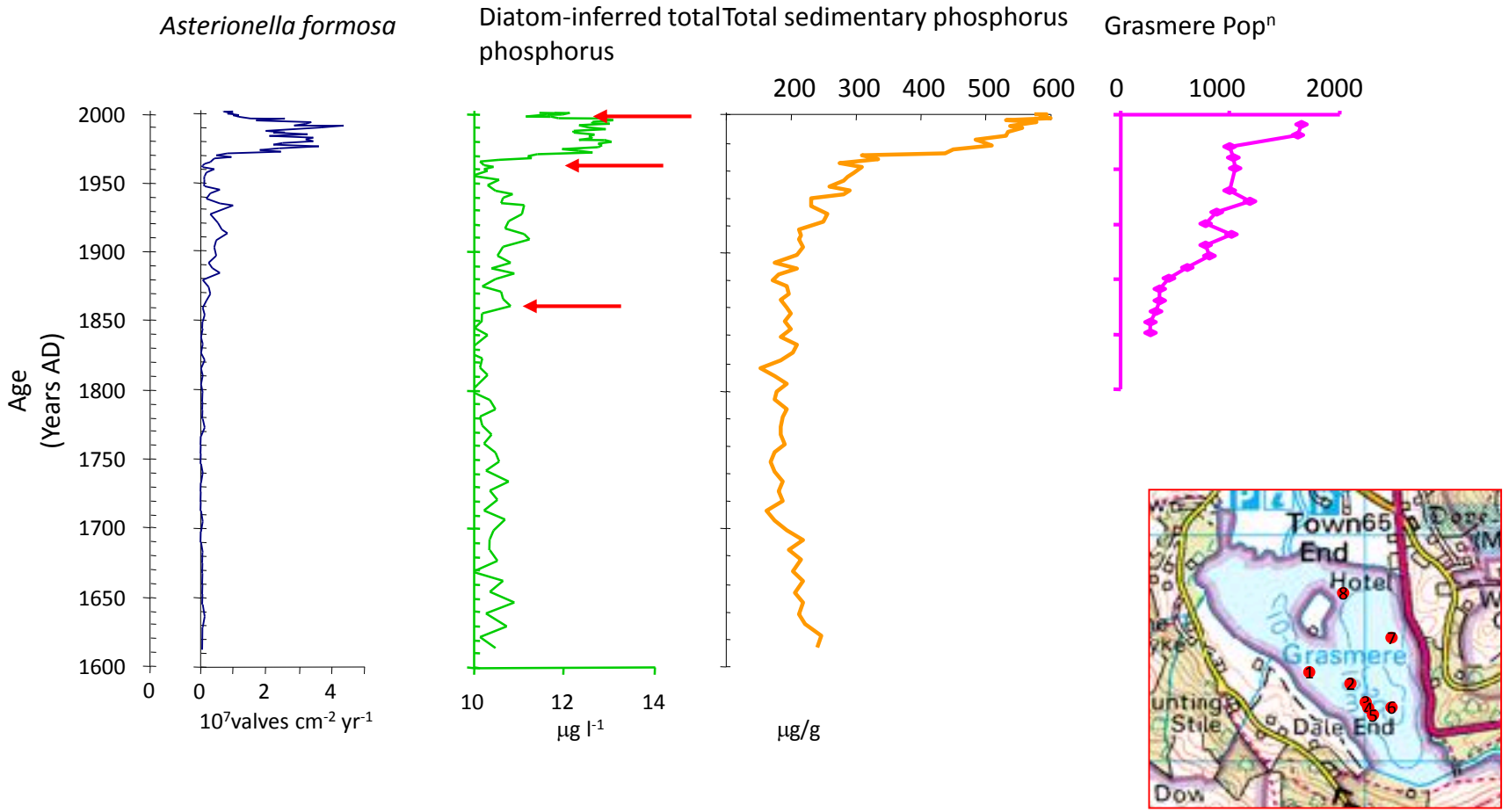
Windermere

- Productivity has increased since 1850s, increase in nutrients N and P, fall in carbon isotopes consistent with increased catchment productivity
- Landuse: population, sewage treatment, agriculture
- Climate: Temperature and precipitation 5-15% of variance



McGowan et al. 2012

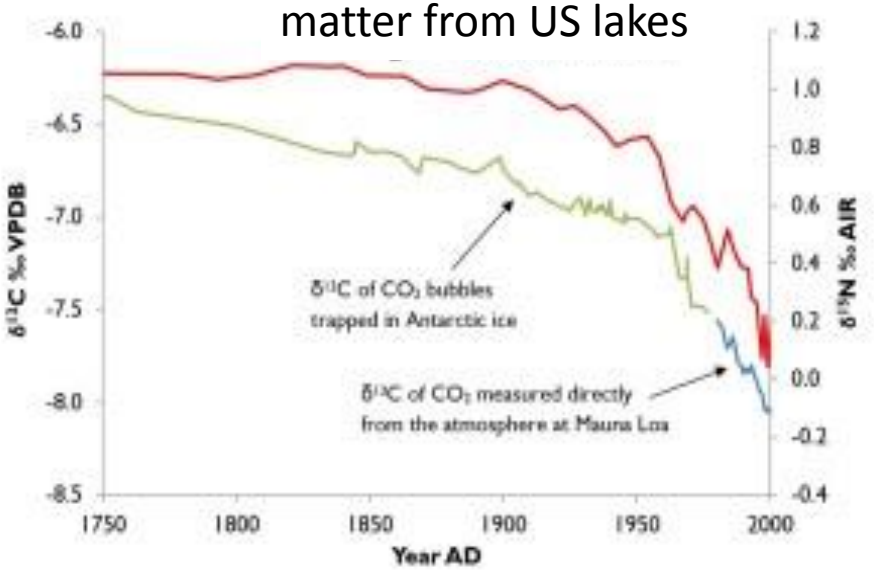
Grasmere

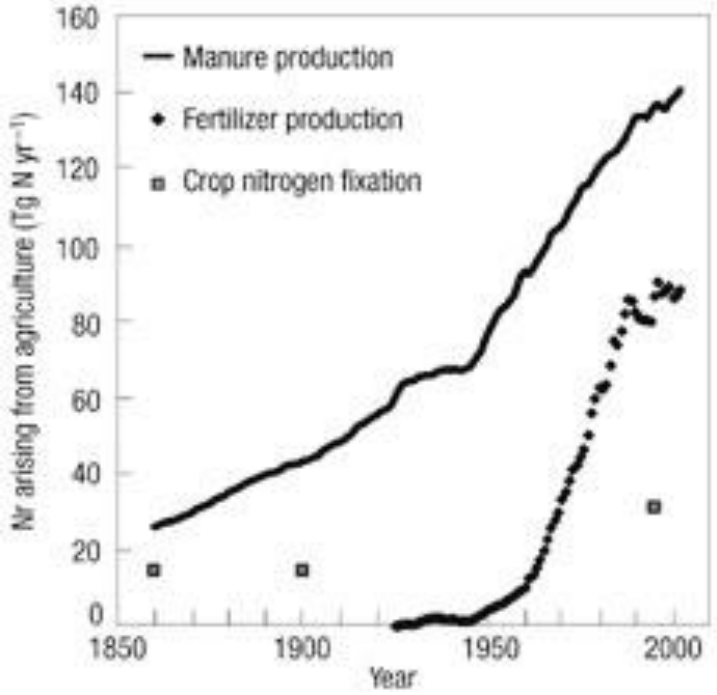


Barker et al. 2005

Hypothesis: a global phenomenon?

δ15N of organic matter from US lakes





Reay et al. 2008

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Conclusions

- Contemporary problems must be viewed in their historical context
- Baselines are anthropogenic not natural; must be dynamic
- Catchment based approaches are needed to tackle catchment-based problems
- Shifting climate patterns and atmospheric N deposition require local adaptation but global solutions