



Professor Sean Comber University of Plymouth

DART - Dart Acid Remediation Trials

Pilot testing calcium carbonate dosing of a headwater to improve water quality and ecology.

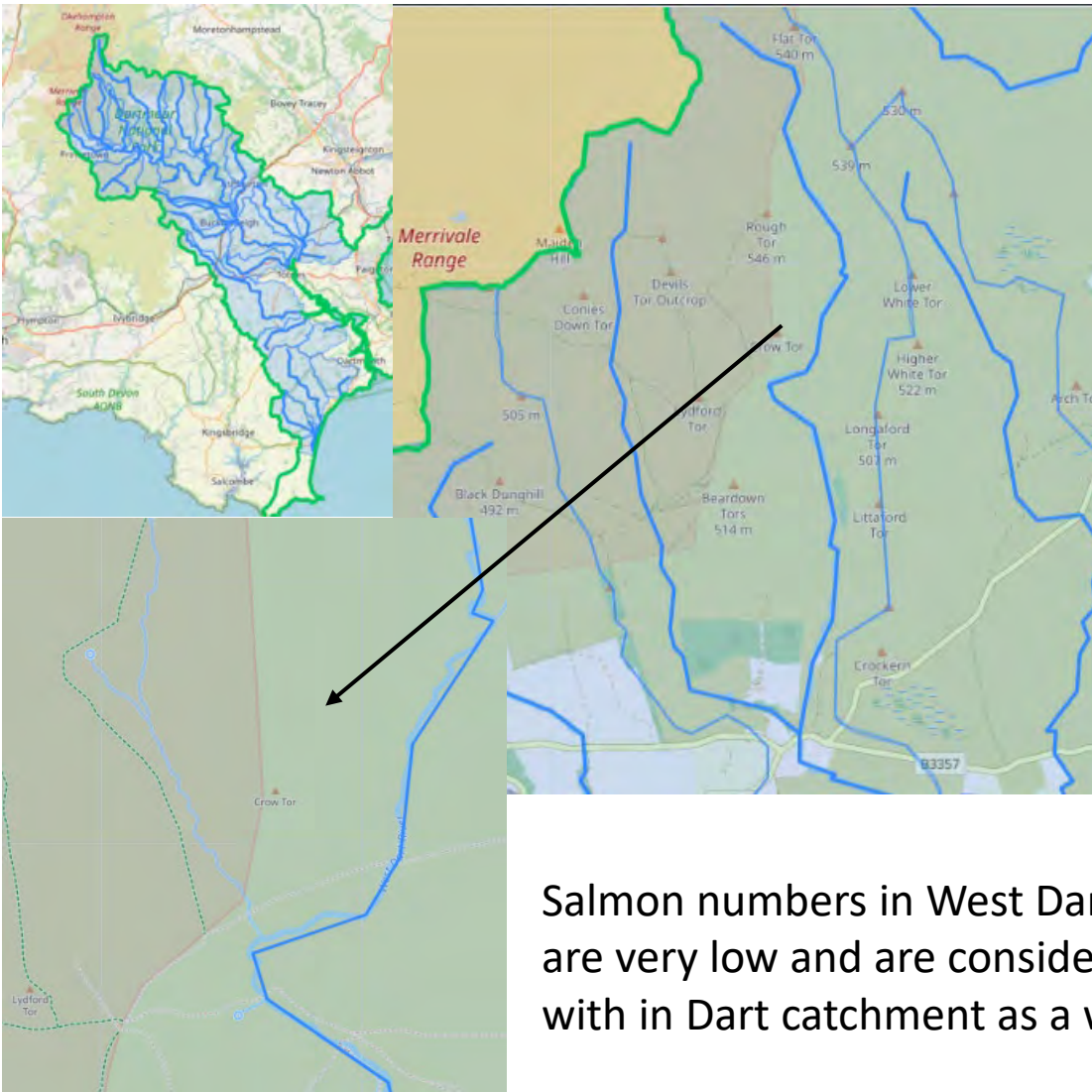
DART - DART ACID REMEDIATION TRIALS

Sean Comber¹, Lauren Dawson¹, Bruce Stockley², Adrian Dowding²



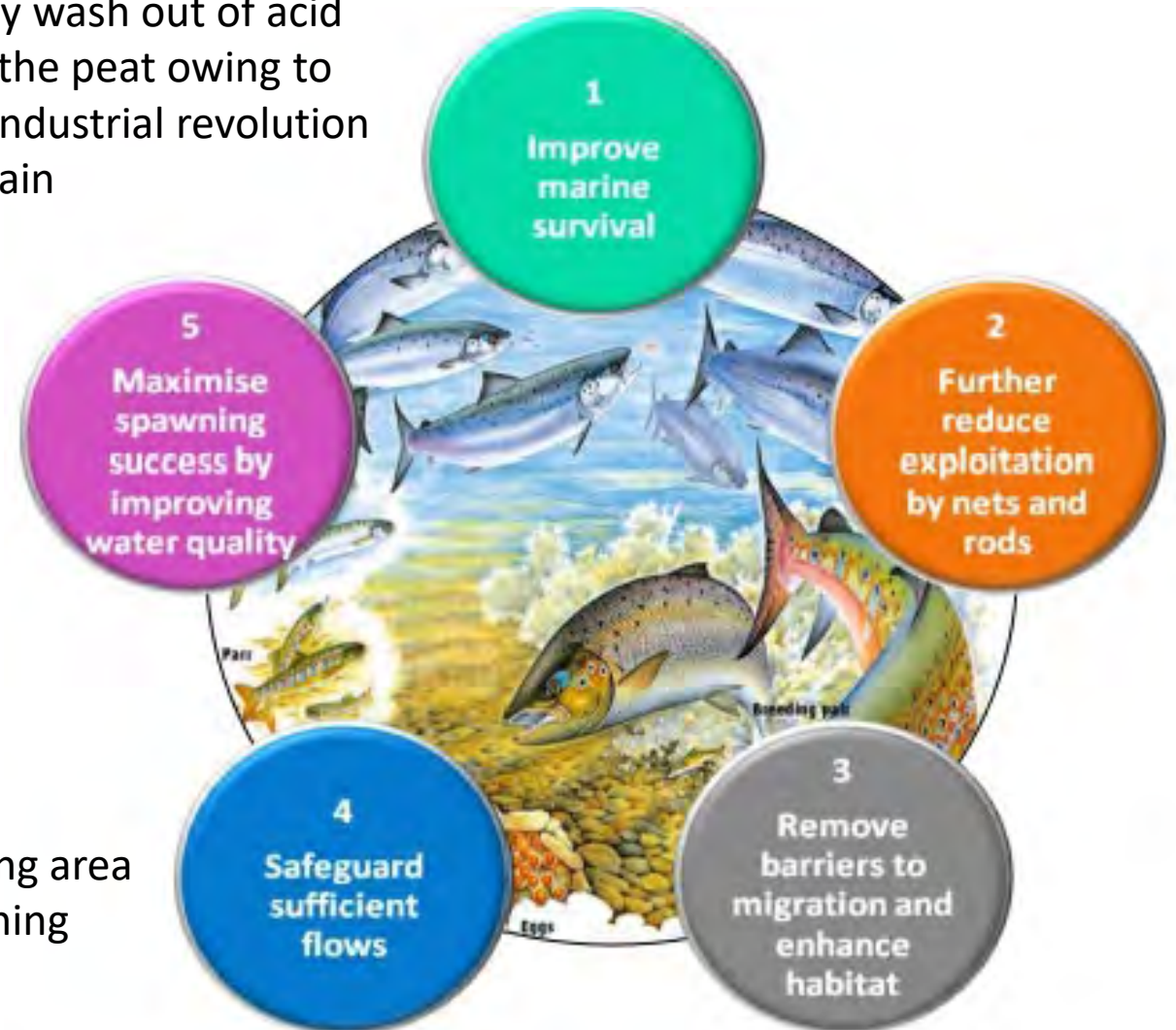
sean.comber@plymouth.ac.uk

DART Acid Remediation Trials

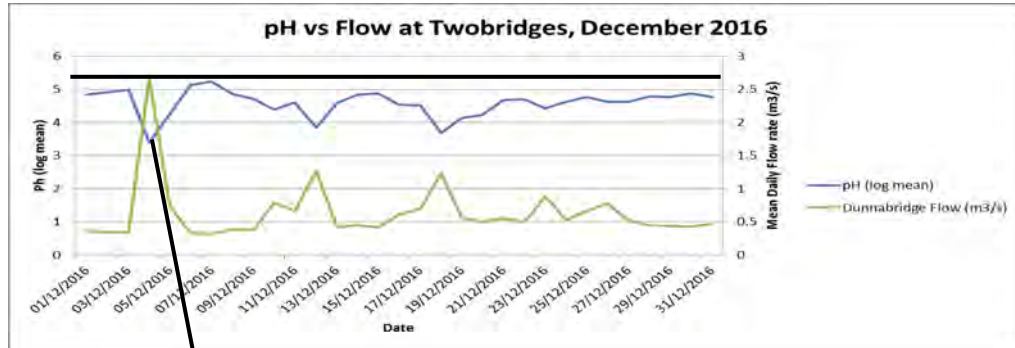


Legacy wash out of acid from the peat owing to post industrial revolution acid rain

Salmon numbers in West Dart spawning area are very low and are considered declining with in Dart catchment as a whole

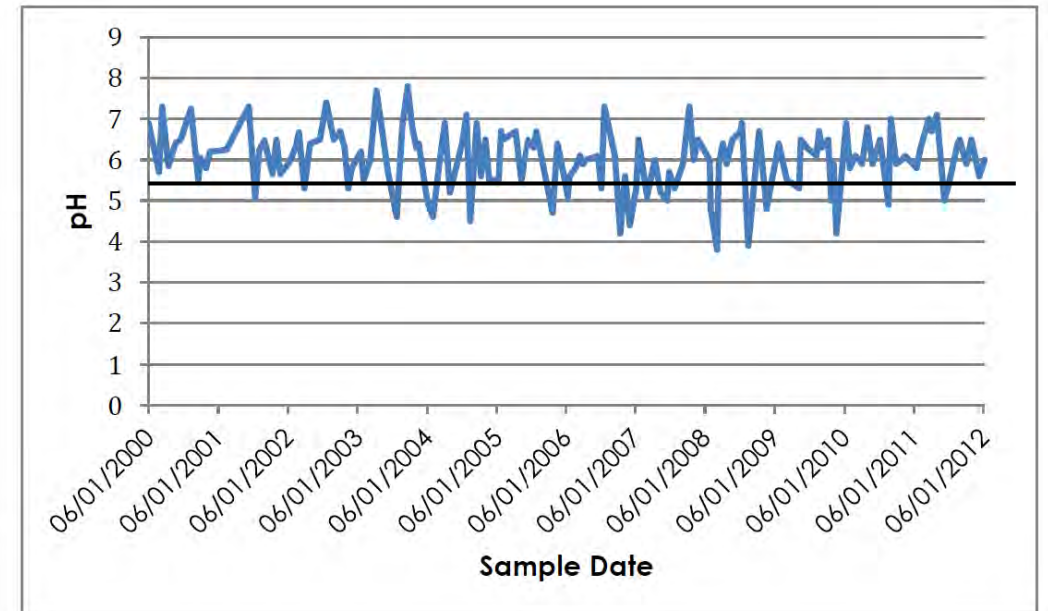
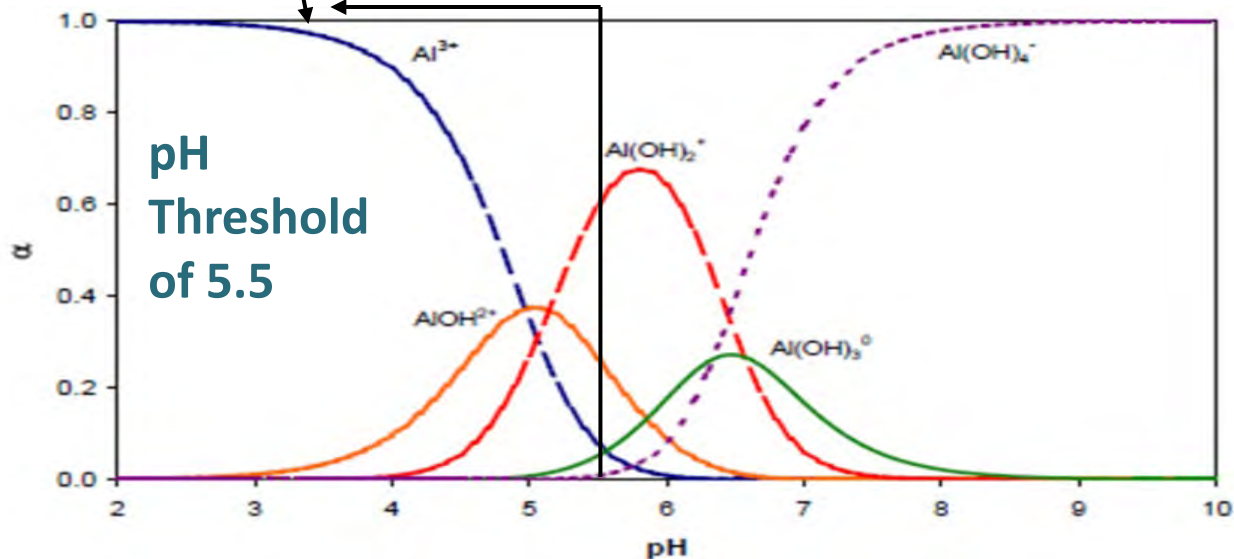


Aluminium effects on fish



- The main organs affected by bioavailable aluminium are the gills (Gensemer & Playle, 2010).
- Osmoregulation and olfactory disruption in smolts.
- $< \text{pH } 5.5$ aluminium is at its most bioavailable for uptake and therefore in its most toxic form.

Increasing toxicity ←

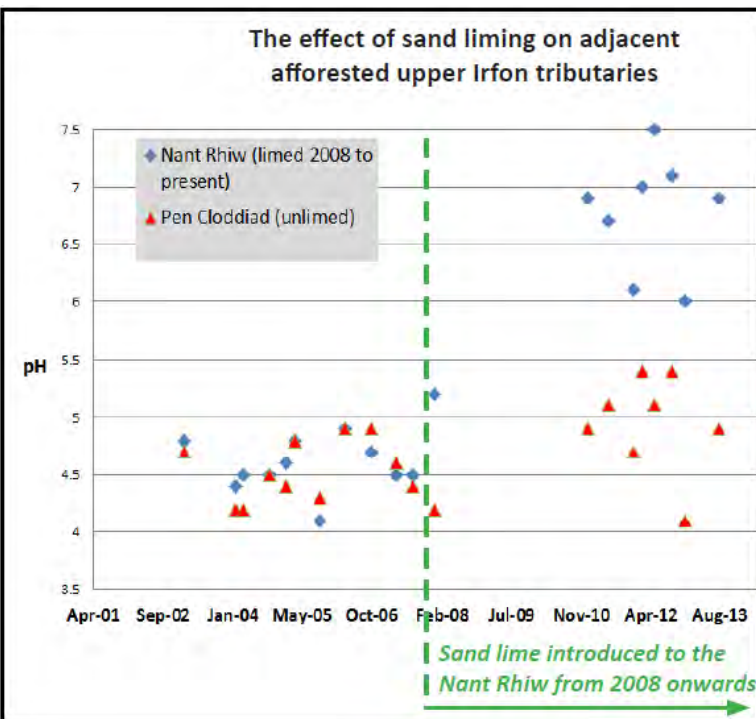


Dart Acid Remediation Trials

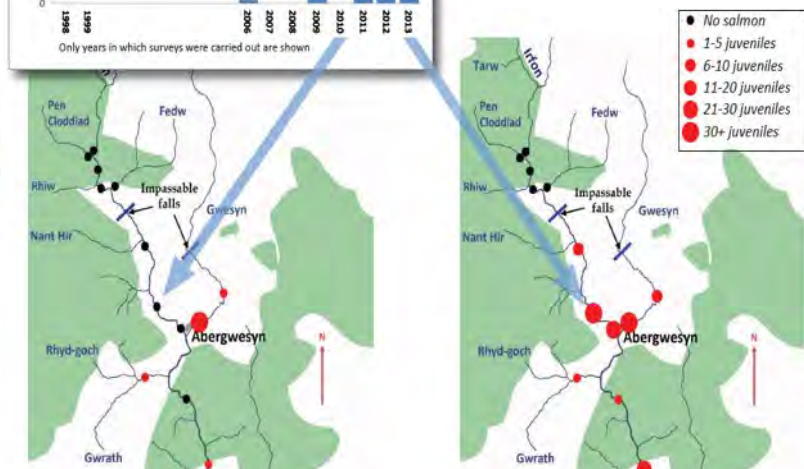
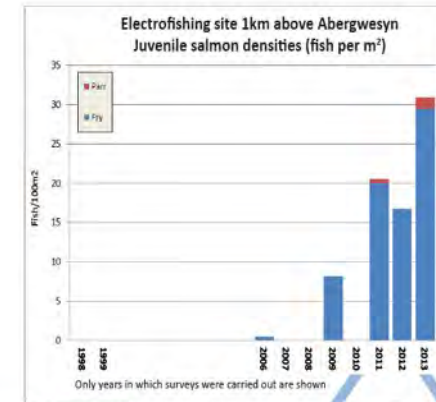
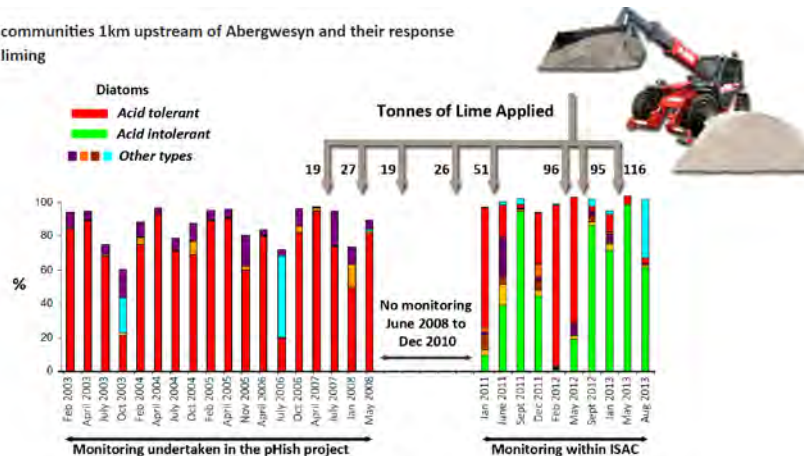
River Wye Experiment (Wye and Usk Foundation)



- Acidification from coniferous forestry
- 100's tonnes put into the headwater streams per year from 2003 onwards – once per year now (~a few tonnes/yr at each site)
- Not subtle.... But effective.....



Diatom communities 1km upstream of Abergwesyn and their response to sand liming



Working on Dartmoor

- Naturally acidic geology
- National Nature Reserve (aesthetics)

Needed to show we could actively manage dosing

Monitoring (chemical and ecological) – pre and post-dosing

- 1st trial ~1 tonnes of 0-4mm calcium carbonate sand deployed in Tinnars Stream
- Continuous in situ monitoring (T, pH, turbidity, DO, flow) and spot samples (metals, nutrients, dissolved organic carbon)
- Ecological – diatoms, invertebrates, macrophytes and fish
- Resulted in little pH impact downstream in W Dart
- But a shift in the diatoms away from acid tolerant dominated species



West Dart Upstream Spring 2018 West Dart Downstream Spring 2018

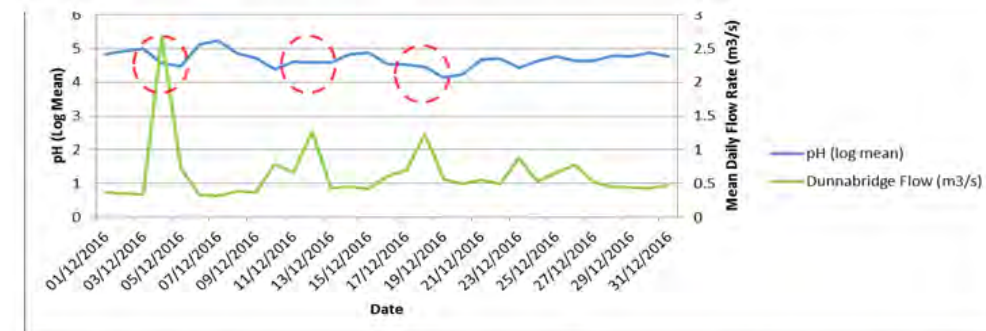
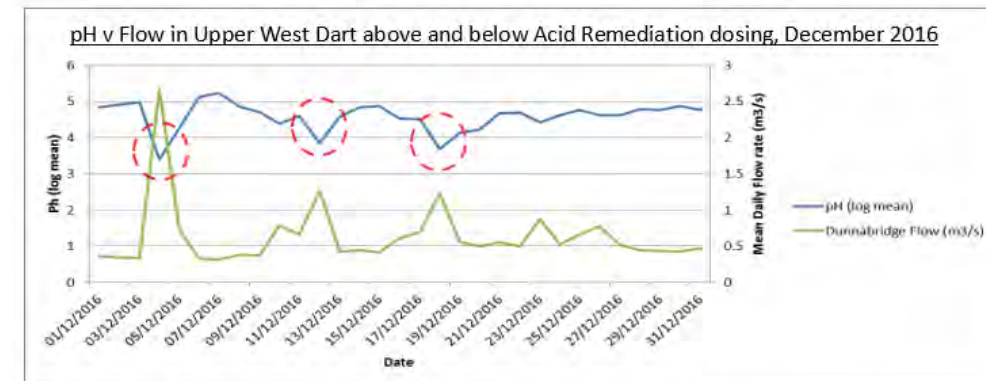
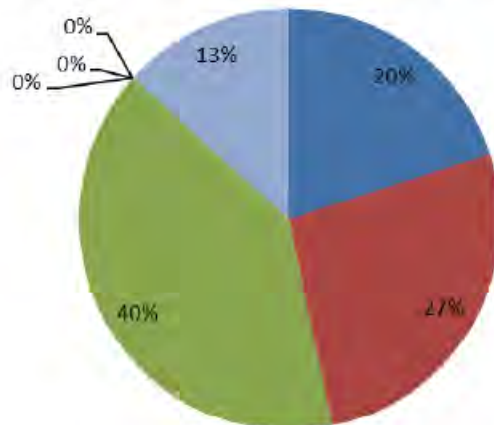
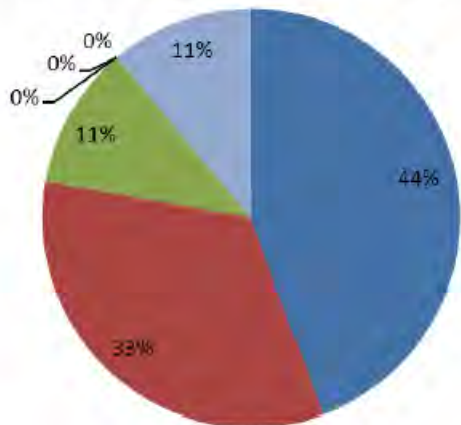


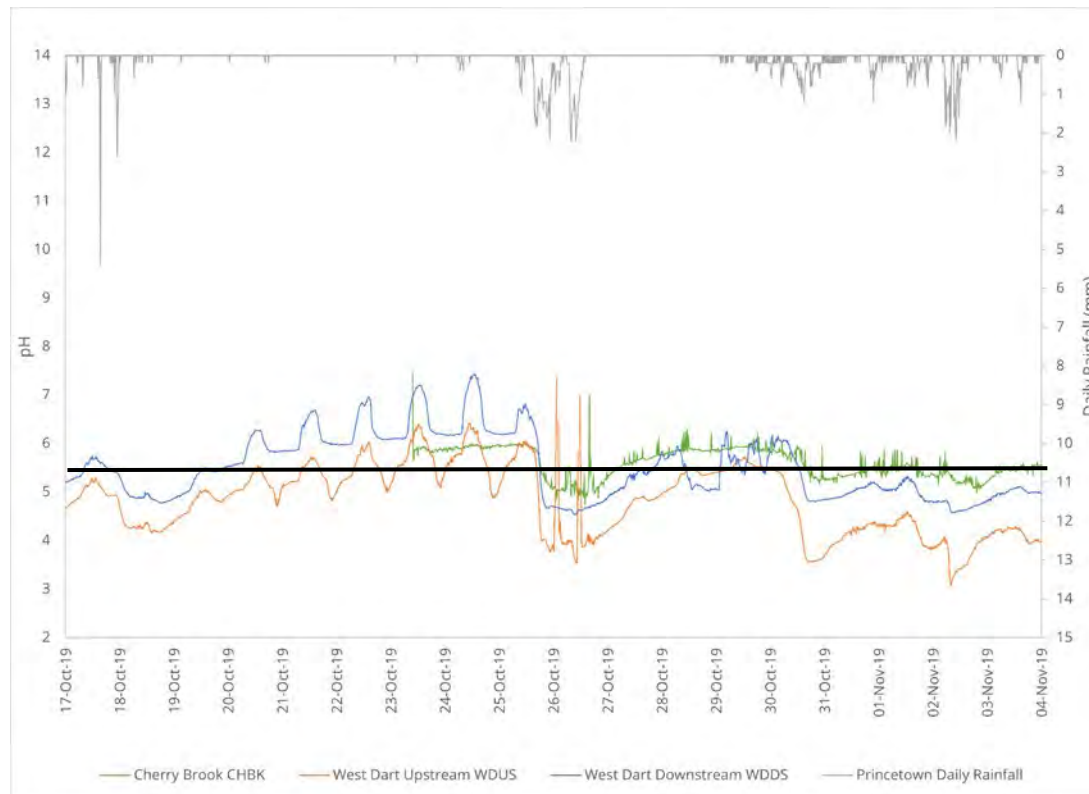
Figure 10: Tinnars Stream acid remediation trial results, Dec. 2016. Upstream (top) acidity spikes below pH4 during three increased flow events and downstream (bottom) acidity indicating buffered above pH4 during the same flows. Comm. L. Dawson (May, 2017)

Dart Acid Remediation Trials

Discussion Points

Phase 2 Trial

- Carbonate sand (900kg) placed at side of Tinnners Stream, washes in under high river flow and/or rainfall
- Clear shift in pH upstream vs downstream
- Closer to pH 5.5 threshold



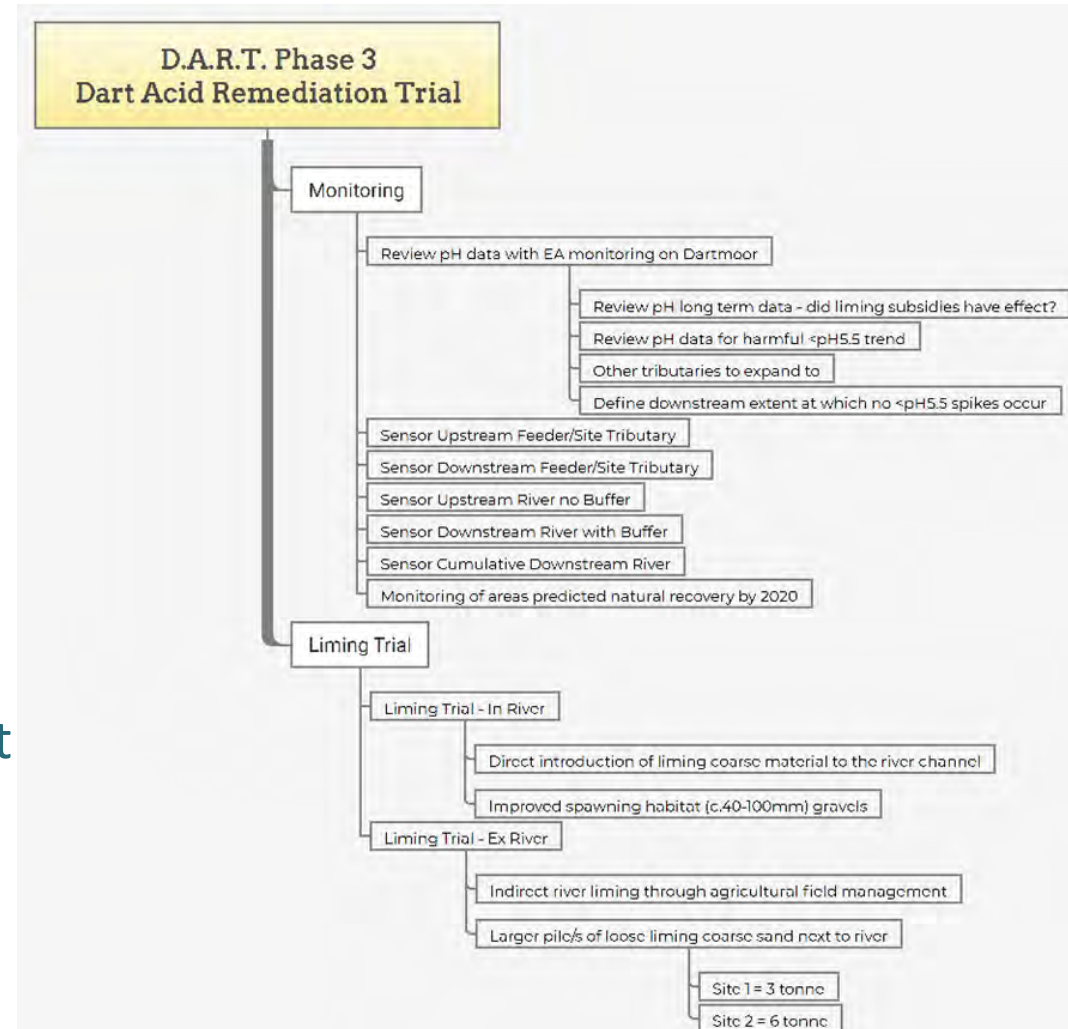
wrt.org.uk

Conclusions

- Dosing the upper W Dart catchment is achievable without ecological detriment
- Bankside dosing is more effective
- But more carbonate required (tonnes)
- And over a period of time
- **Natural Recovery is desired** – but we need to monitor and ascertain this is/will happen





Long & Short Term Aims




- Aims to replace short-term active management with landscape recovery and natural acidity buffering in the long-term.
- A continuation trial of increased scale and alternative methods, meeting the aim of a predominant pH above 5.5.
- Meet good ecological status for water quality on the Dart and conservation of Atlantic salmon and other acid sensitive taxa.






Working together



-  Fisheries experience
-  Landowner/stakeholder contact network
-  Catchment specialists
-  Monitoring expertise and equipment

-  Funding
-  Collaborative approach
-  A passion for the environment

-  Analytical capability
-  Sensors in the environment (Leo Lab)
-  Catchment and Environmental Scientists

Thank You



plymouth.ac.uk

sean.comber@plymouth.ac.uk



www.slido.com with #3406402