Urban Water Security Research Alliance

Revisiting Artificial Monolayers to Reduce Evaporative Loss

Pam Pittaway, Nigel Hancock, Gavin Brink, Troy Symes, Erik Schmidt

Systems Losses

Theme C 17th August 2009

Queensland Government

CSIRO

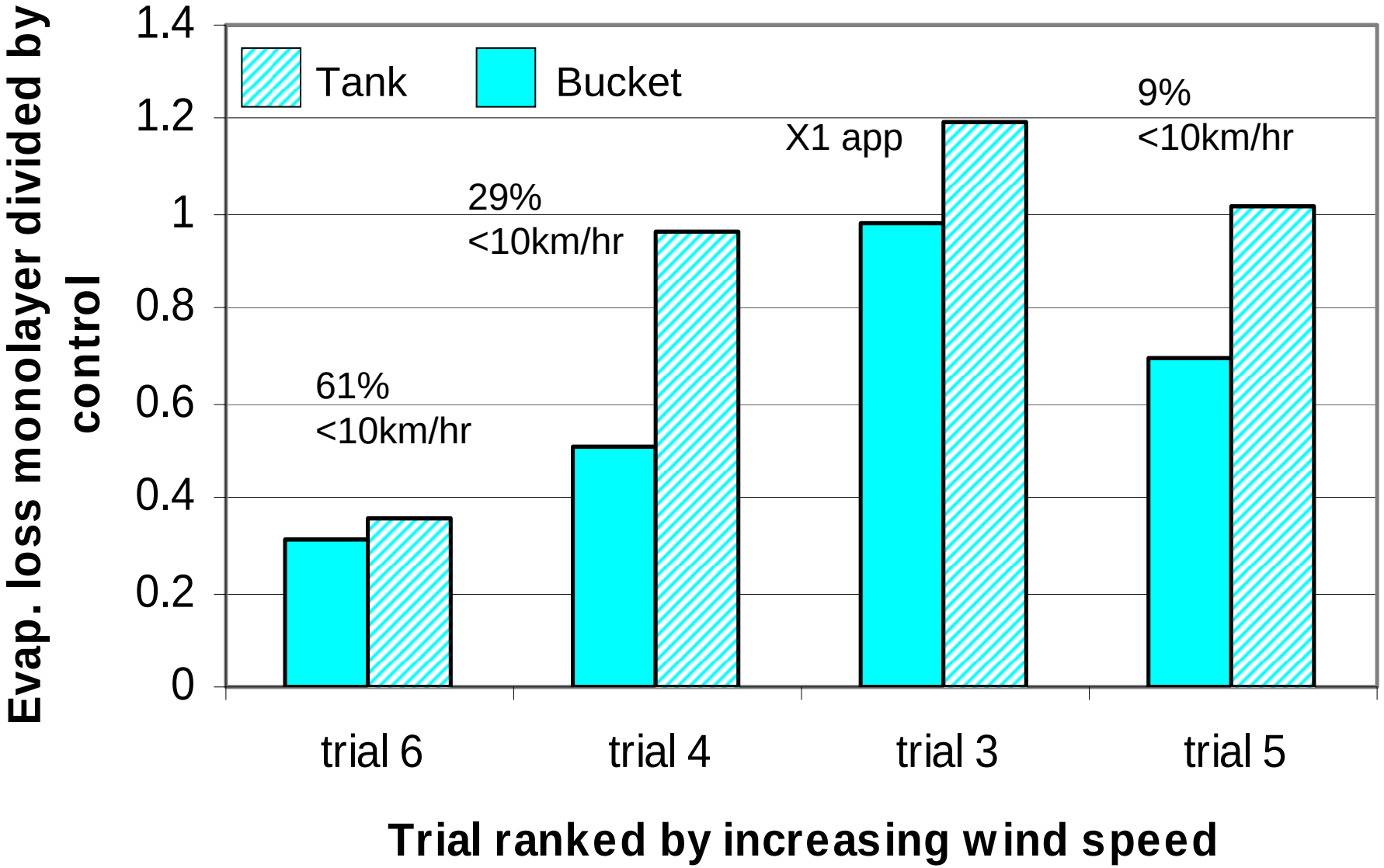
Griffith UNIVERSITY

The University Of Queensland AUSTRALIA

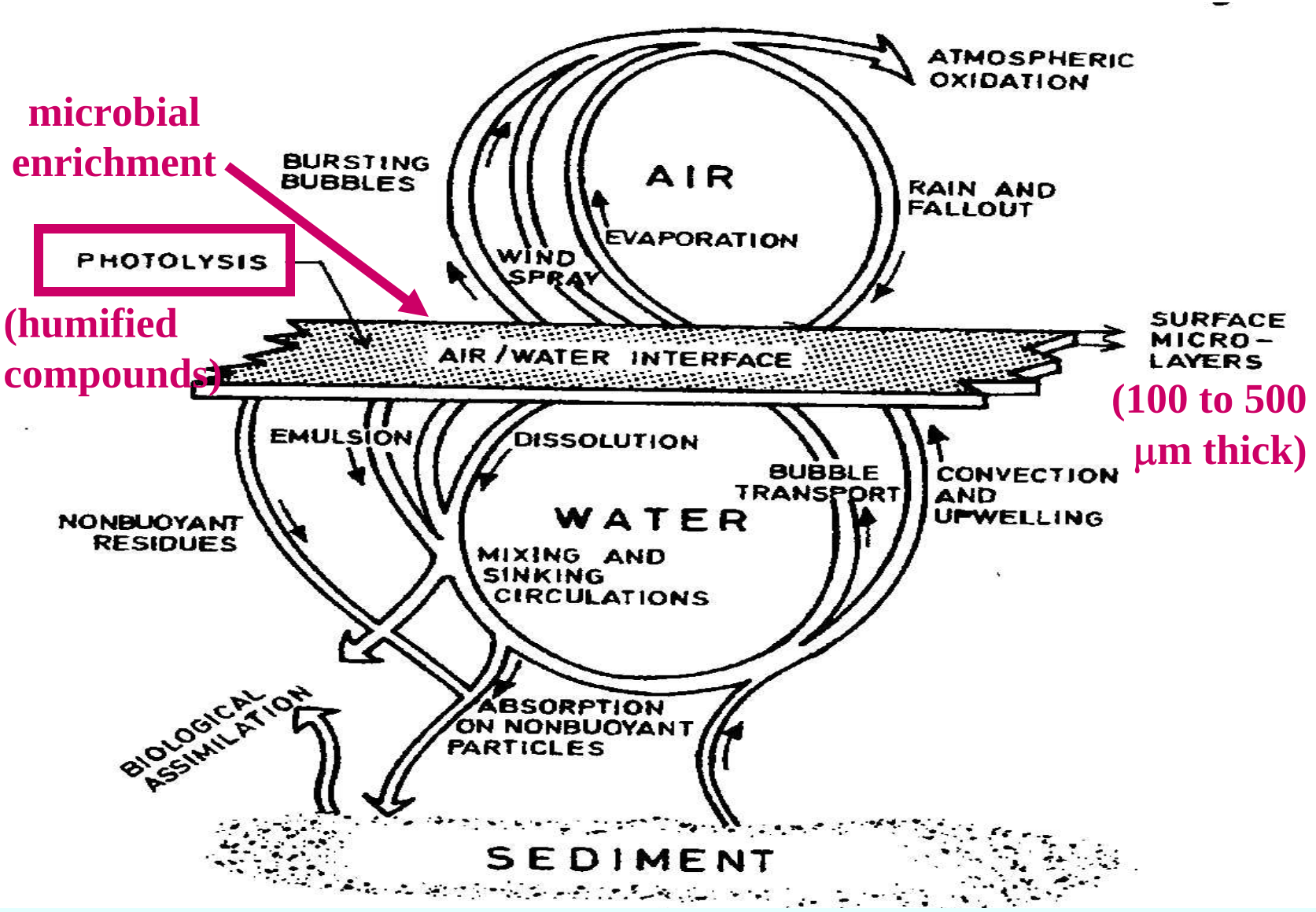
CONSERVING WATER WITH MONOLAYERS

- Insoluble surface layer 1 molecule thick (low application rates eg 26 g/ha)
- Condensed hydrophobic chains reduce evaporative loss (20-40% less evaporation)
- Increase in surface pressure dampens waves (>15 mN/m)
- Spontaneously re-spreads if disrupted by wind (>20 km/hr)

EVAPORATIVE SAVINGS WITH MONOLAYERS AT X2 SCALES (bucket 0.06m^2, tank 2.9m^2)



NATURAL MICROLAYERS & WATER BODIES



Norkrans 1980 Advances in Microbial Ecol 4 pp51-85

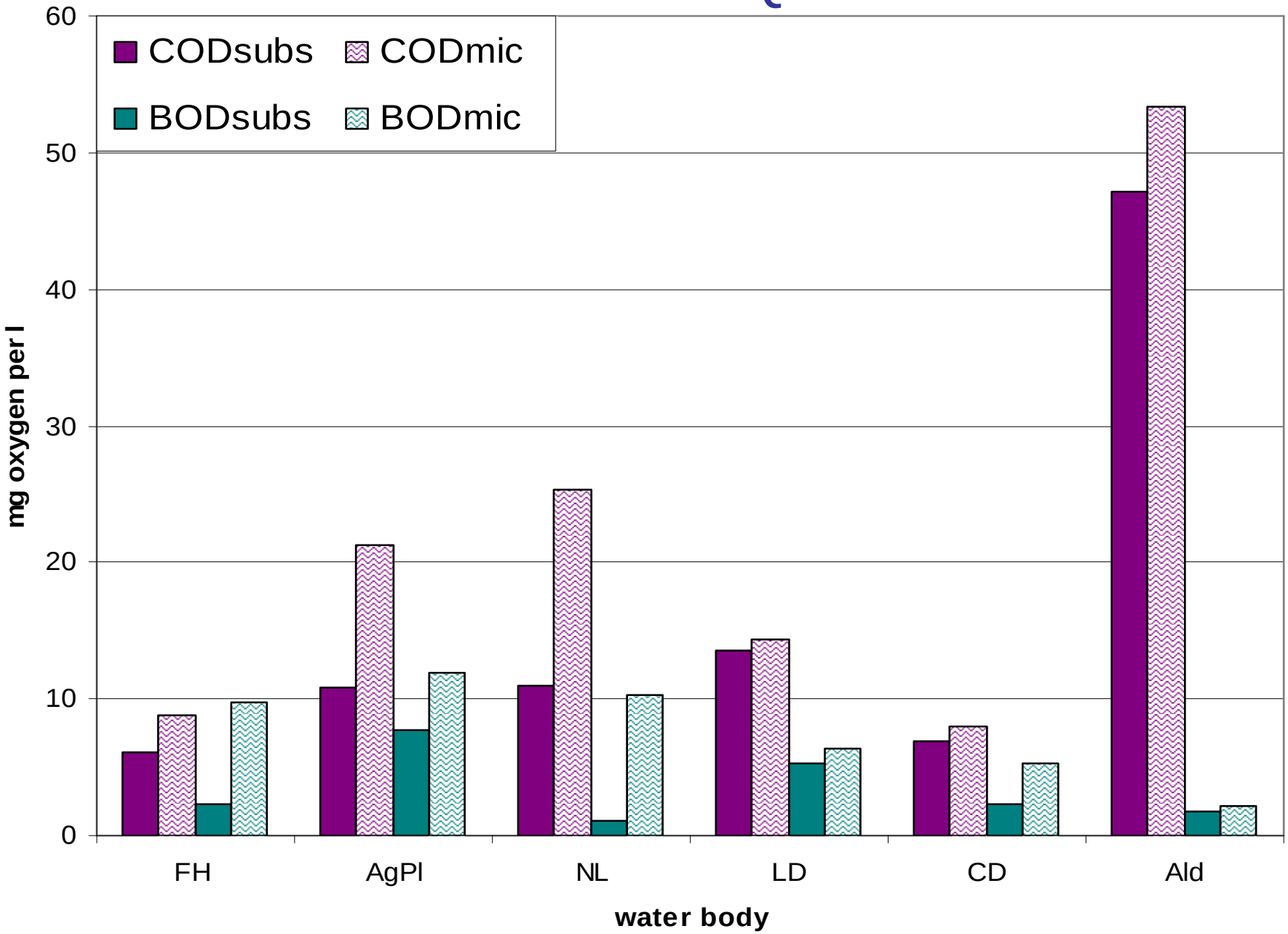
ISSUES FOR UWS RESEARCH ALLIANCE

- Impact of artificial monolayers on freshwater ecology
- Impact of natural microlayers on artificial monolayers
- Impact of artificial monolayers on potable water treatment
- Application system that meets economic and environmental criteria

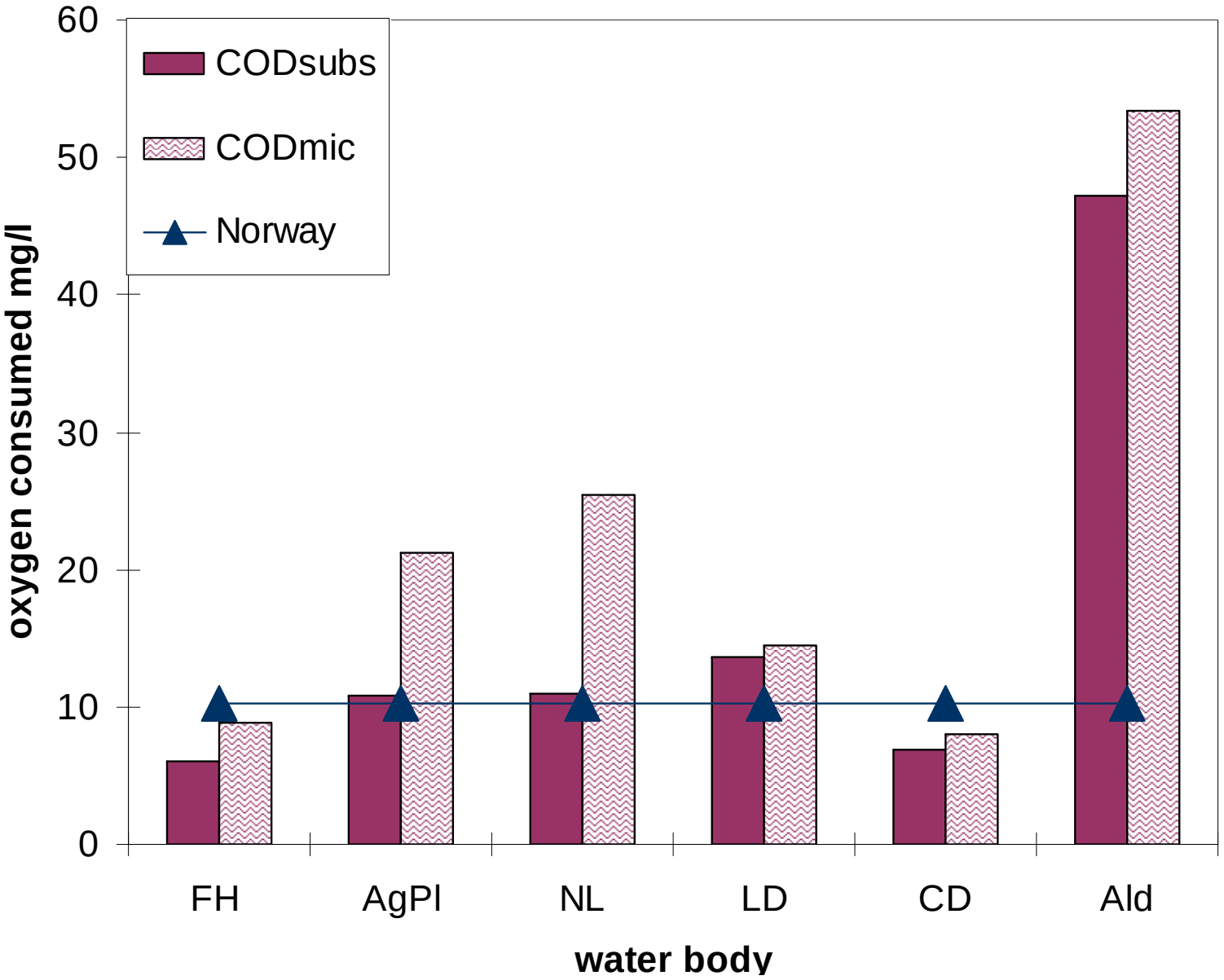
BENCHMARKING FRESHWATER ECOLOGY

CSIRO staff Vlad Matveev, Andrew Palmer starting sampling program at Logan's storage

BIOCHEMISTRY OF SEQ MICROLAYERS



SEQ VS NORWEIGAN MICROLAYERS



CHEMICAL COMPOSITION OF LEAF LITTER

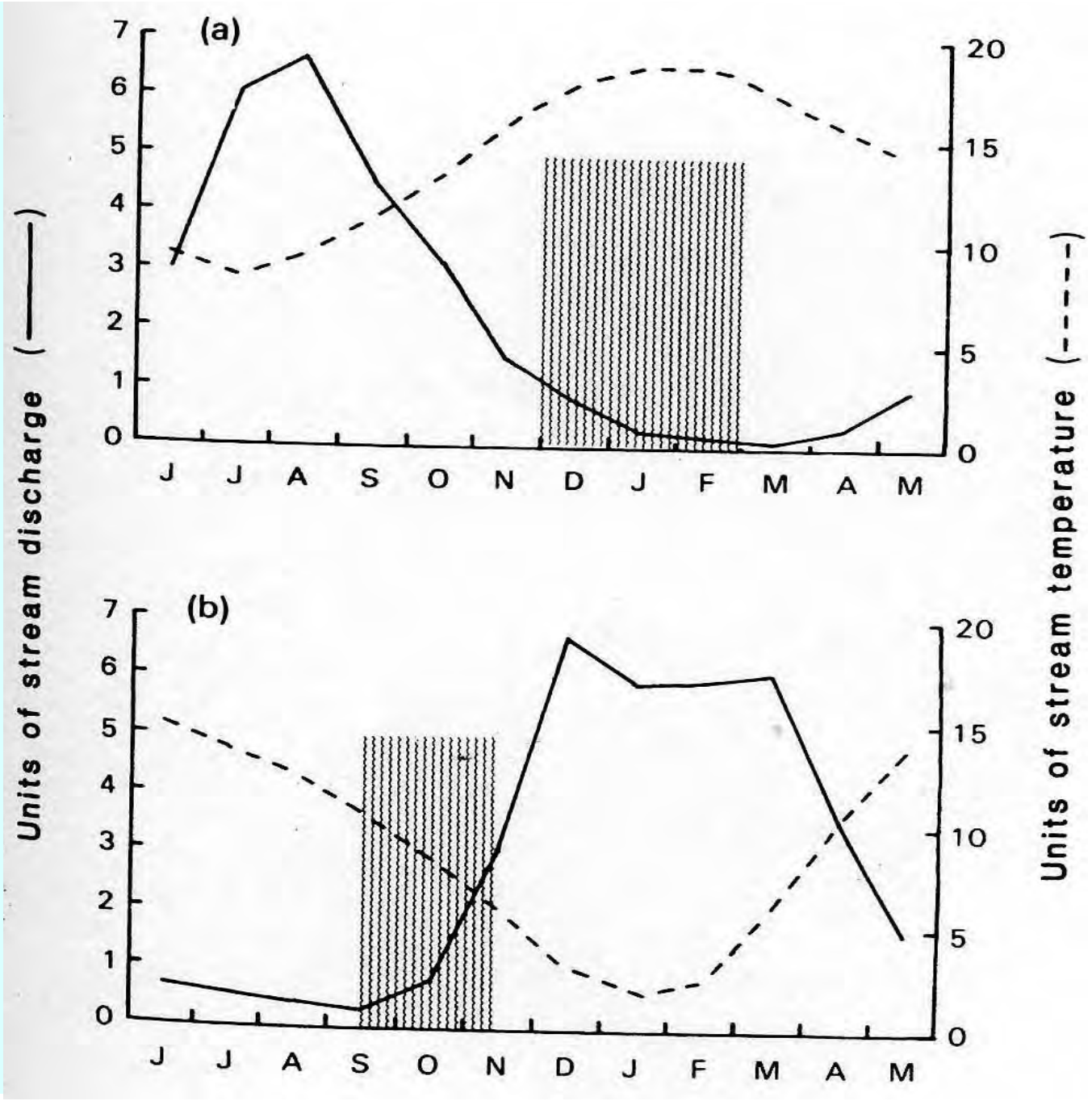
TREE SPECIES	Total Org N	Polyphenols	Lignin
	% dry wt	% dry wt	% dry wt
Acacia melanoxylon	**2.34**	**16.4**	**26.8**
Eucalyptus camaldulensis	**1.29**	**16.0**	**15.1**
Eucalyptus maculata	**0.97**	**13.1**	**24.0**
Eucalyptus ovata	**1.42**	**16.8**	**21.8**
Carya glabra	**1.48**	**9.1**	**10.0**
Cornus florida	**1.30**	**na**	**8.1**
Quercus alba	**0.71**	**16.2**	**12.2**
Rhododendron maximum	**0.75**	**na**	**7.7**

Bunn (1986) Limnology in Aus. Eds Deckker & Williams

Nthn (b) vs Sthn (a) Hemisphere leaf - and bark fall, as key microlayer components.

Vertical bars indicates peak litter fall.

Bunn (1986) in Limnology in Aus. Eds Deckker & Williams



NCEA RESEARCH AND UWSRA ’09/10

- Benchmarking seasonal changes in natural microlayer (monolayer impact)
- Lit. survey impact of artificial monolayers on water quality & water treatment
- PhD program interactions aquatic humic substances & monolayers
- CRCIF PhD program autonomous monolayer application system

COOBY DAM, full capacity 21,177Ml, 306 ha