AGRICULTURAL PHOSPHORUS STRATEGIES TO COMBAT EUTROPHICATION

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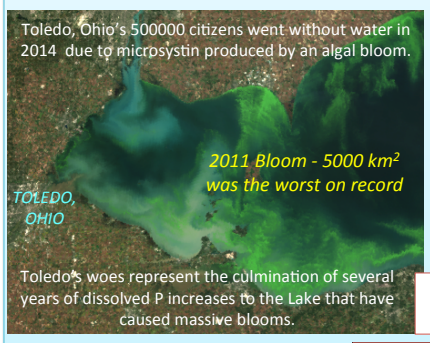
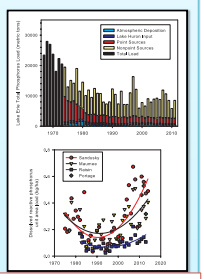
LAKE ERIE, USA

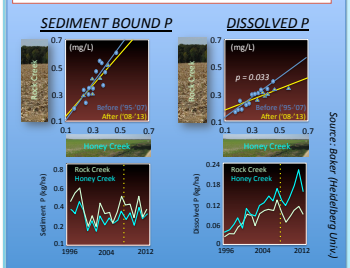
Voluntary, competing interests





Long term success in curbing total P loads undermined by uptick in dissolved P.

Understanding trade-offs, a difficult sell. *Confronting the "win-win" expectation of conservation and phosphorus mitigation.*

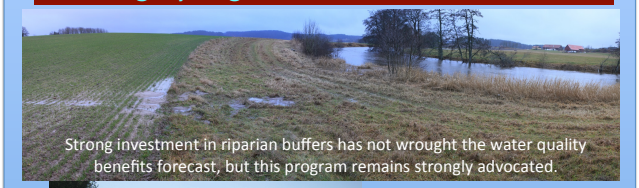


Expansion of cover crops in the Honey Creek targeted watershed after 2008 actually increased dissolved P in runoff relative to Rock Creek, the conventionally managed watershed

Voluntary approaches have been led by traditional conservation priorities. Instead, a Comprehensive, "all of the above approach" is required (nutrient management 4R, tillage management, tile drain management, updated fertilizer recommendations).

SWEDEN'S BALTIC WATERSHEDS

Highly regulated and subsidized

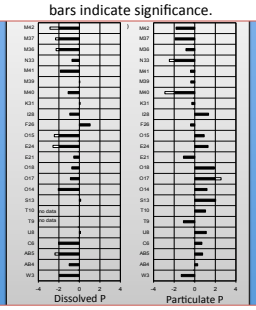


Strong investment in riparian buffers has not wrought the water quality benefits forecast, but this program remains strongly advocated.

Trade-offs are often overlooked in promoting practices and programs. For constructed wetlands, dissolved P removal ability often declines unless new sources of P binding capacity are added.

Extensive regulations and subsidies have resulted in the widespread implementation of practices such as riparian buffers. While adoption has been a success, little assessment of cost-efficacy has occurred. Nor does this seem to be a priority concern at present.

Trends in Sweden's Baltic watersheds for dissolved and particulate P. White bars indicate significance.



Despite widespread subsidy, significant reduction in watershed P loads are mixed. Ironically, dissolved P trends are more promising than particulate P.

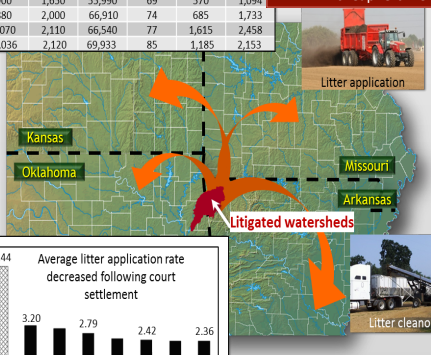
CASE STUDIES

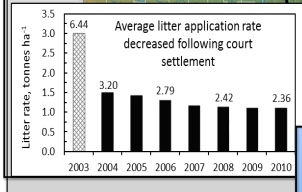
ARKANSAS/OKLAHOMA, USA

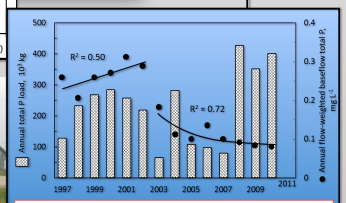
Litigation settlement

A court mandated outcome has not wrought the dire consequences to the poultry industry that was once predicted. Beef producers, not part of the law suit, have seen a decline in pasture productivity and stocking rates due to the loss of a cheap fertilizer source.

Year	P exported	N exported	Mass litter exported	Percent litter exported	Replacement cost P	Replacement cost N
	tonnes			%	$1000	
2004	900	1,650	55,990	69	570	1,094
2006	880	2,000	66,910	74	685	1,733
2008	1,070	2,110	66,540	77	1,615	2,458
2010	1,036	2,120	69,933	85	1,185	2,153







Watershed P loads have not yet declined since the beginning of the export program in 2004. However, concentrations are trending down.

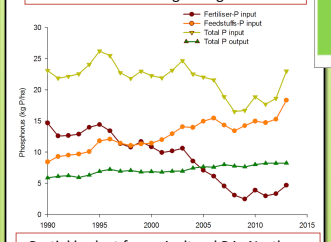
UK Watersheds

N. Ireland and Great Britain

Voluntary/coercive programs in Great Britain (none are P-based) contrast with Northern Ireland's P-balance regulations applied to. Feed has replaced fertilizer as a primary P input. The EU Nitrates Directive is not readily adapted to P, particularly with regard to manure.

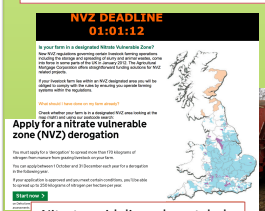
No specific P based regulations aimed at agriculture in Great Britain.

Northern Ireland – regulating P balances



Partial budget for agricultural P in Northern Ireland (1990-2013). Successes in feed and fertilizer P conservation have recently been reversed.

In Northern Ireland, regulating fertilizer has been more politically palatable than regulating feed.



Nitrate guidelines do not help with P accumulation. Monitoring soil P is a hard sell.

GB catchment programs have had local success

80-90% of farmers at catchment outreach events felt better engaged with diffuse pollution concerns