

Pros & cons of alum injection

Advantages

- Treat only water discharged
- Reduced chemical cost
- Can produce very high efficiencies (>90%)
- Can easily vary dosage according to water quality characteristics

Disadvantages

- Source water is untreated
- Need adequate retention area to settle floc
- High maintenance requirements (pumps, etc)
- Need substantial infrastructure (roads, tanks, plumbing)

Alum Application Issues

- Alum dosage usually determined by lab testing of water to be treated (bench tests)
- Most common issue with alum treatment is under-dosing
- Under-dosing often forms 'microfloc' (small floc particle size) which may not settle for long time periods
- 'Microfloc' may be identified by high particulate Al, low SRP but high particulate P in treated water samples



Photo courtesy of DB Environmental

Alum Impacts

- High total aluminum concentrations in receiving waters result primarily from discharges of 'microfloc' - low dosage or inadequate treatment area
- Total aluminum usually non-toxic to biota and relatively harmless to benthic invertebrates unless heavy sediment cap is formed
- Some dissolved forms of aluminum may become toxic to biota at low pH (<5)
- Most P in 'microfloc' is not biologically available to plankton

Alum Chemistry

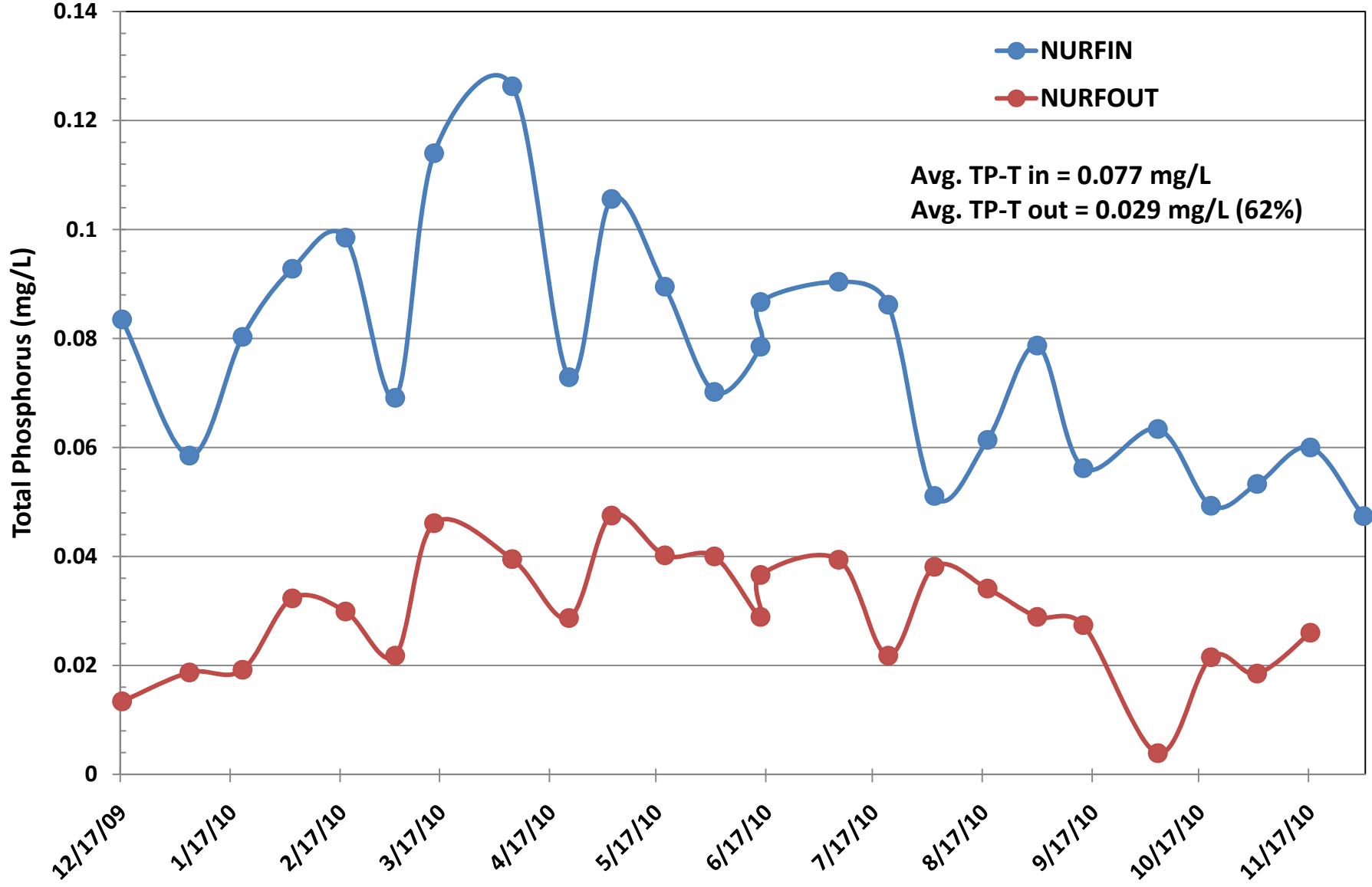
- Alum most effective at adsorption of dissolved inorganic P (SRP) – chemical process
- Dissolved organic P (DOP) less effectively removed by alum
- Particulate P (PP) primarily removed by entrapment in the settling ‘floc cloud’ – physical process

Alum Chemistry

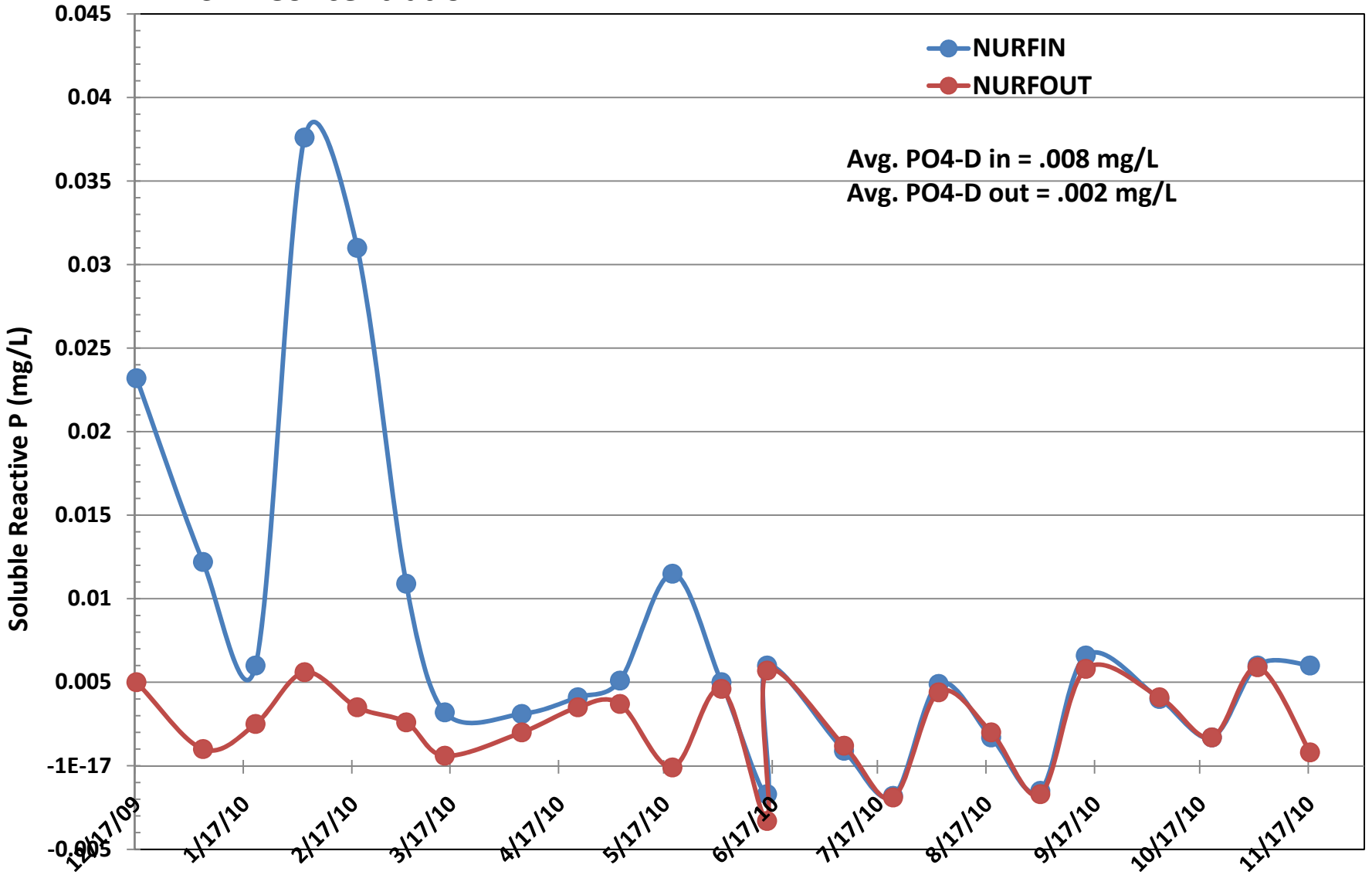
- 'Floc' is usually stable in water at pH ~5.5-9.0
- Lower or higher pH may result in re-release of P from 'floc'
- Maximum 'floc' formation occurs at pH 6-8
- Alkalinity and pH are critical in alum treatment (low alkalinity requires buffering to achieve acceptable pH) – lime, sodium aluminate

Nutrient Reduction Facility

Total Phosphorus Concentration



Nutrient Reduction Facility SRP Concentration



Nutrient Reduction Facility Total Aluminum Concentration

● NURFIN
■ NURFOUT

