

2005

Research Update Meeting 2005: Nutrition

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Phosphorus

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Why Phosphorus?

- Nutrient management planning pressure
- Inland water body eutrophication
- Difficult to manage in cranberry due to acidic soils



New Phosphorus publication

- Handed out today
- Contains information from last 20 years of national cranberry research
- Research remains in progress for rates, soil tests, and water management



Phosphorus Budget for Cranberry Harvest Floods

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Background

- Previous research has shown that flood practices in cranberry farm operations may be the most likely activities to move nutrients off-site (Howes and Teal).
- Phosphorus is of particular concern as it is often the limiting nutrient in fresh water systems – increasing P has been associated with fresh water eutrophication.



Research questions

- Is P exported from cranberry bogs during flood harvest?
- Can harvest management be modified to affect P movement?



Methods

- 5 Sites
- 2002 and 2003
- Water volume measured:
 - Pump logs maintained by growers
 - Measured flows using instrumentation in canals
 - Estimates based on measured depth (on bog) and known bog area.



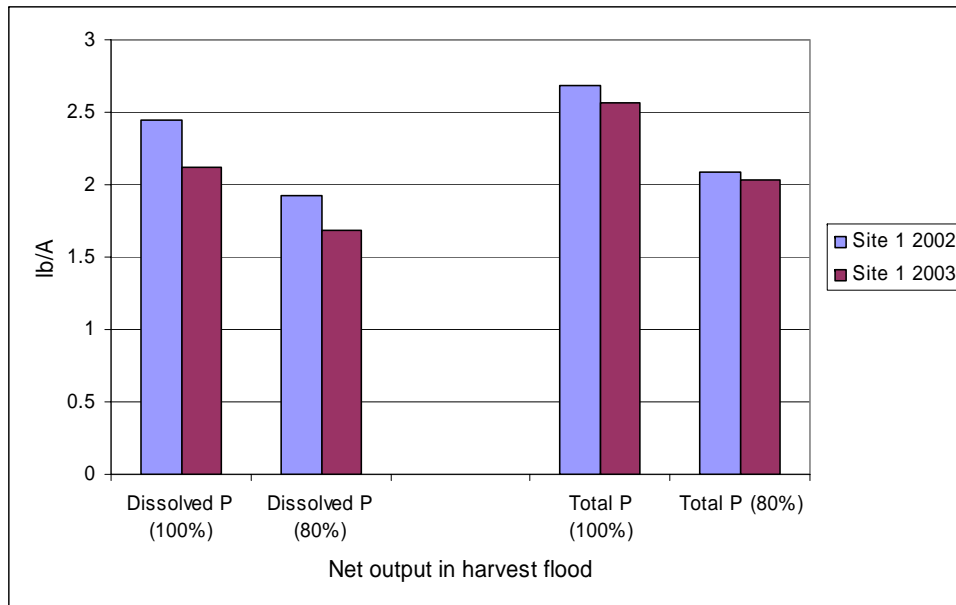
Methods

- Phosphorus in water measured
 - Duplicate samples
 - Ortho-P or dissolved inorganic P
 - Total P – includes organic and particulate P.
- Budgets determined by calculation (volume x concentration of P in water)



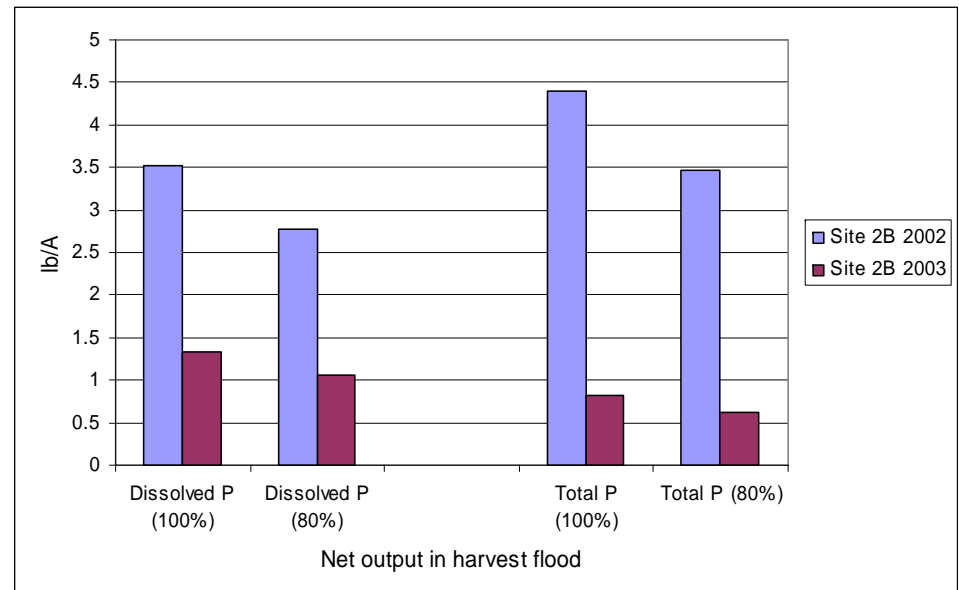
Methods

- Budgets determined by calculation (volume x concentration of P in water)
 - In addition to actual volume measurements in outflow, we calculated outflow values based on total inflow
 - Assumption 1 – all water that flowed in, flowed out (100%) – worse case scenario
 - Assumption 2 – 80% of inflow remained to flow out – based on field data collected at Site 1 and most likely a better estimate than the 100%.



Net loss of ~ 2 lb P per acre of bog

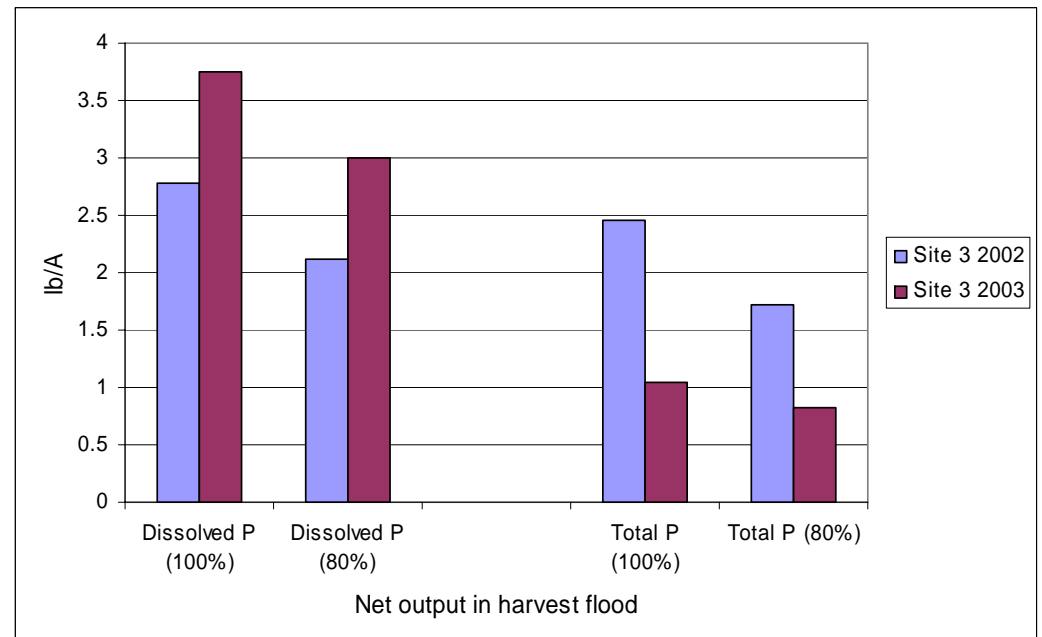
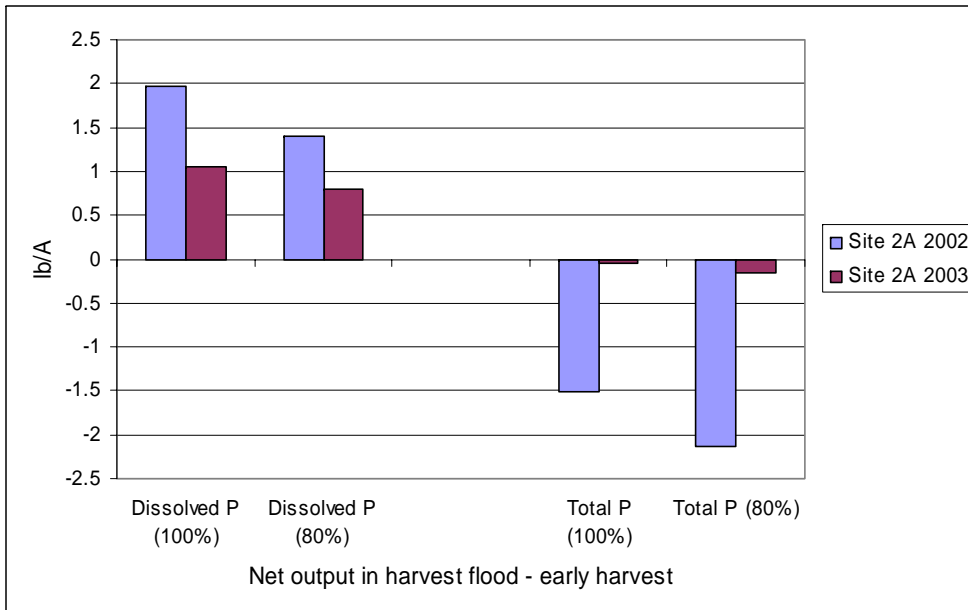
Site 1 received less P than Site 2B in 2002

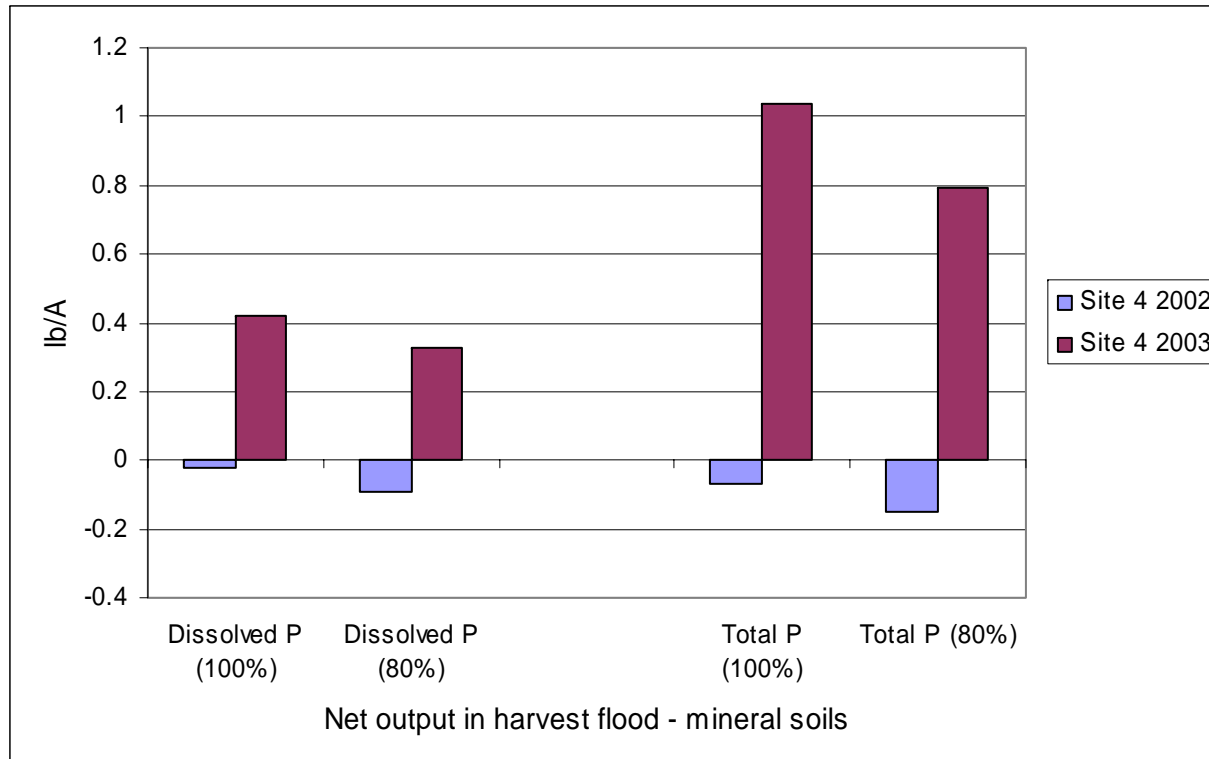




Particulate P filtering at some sites

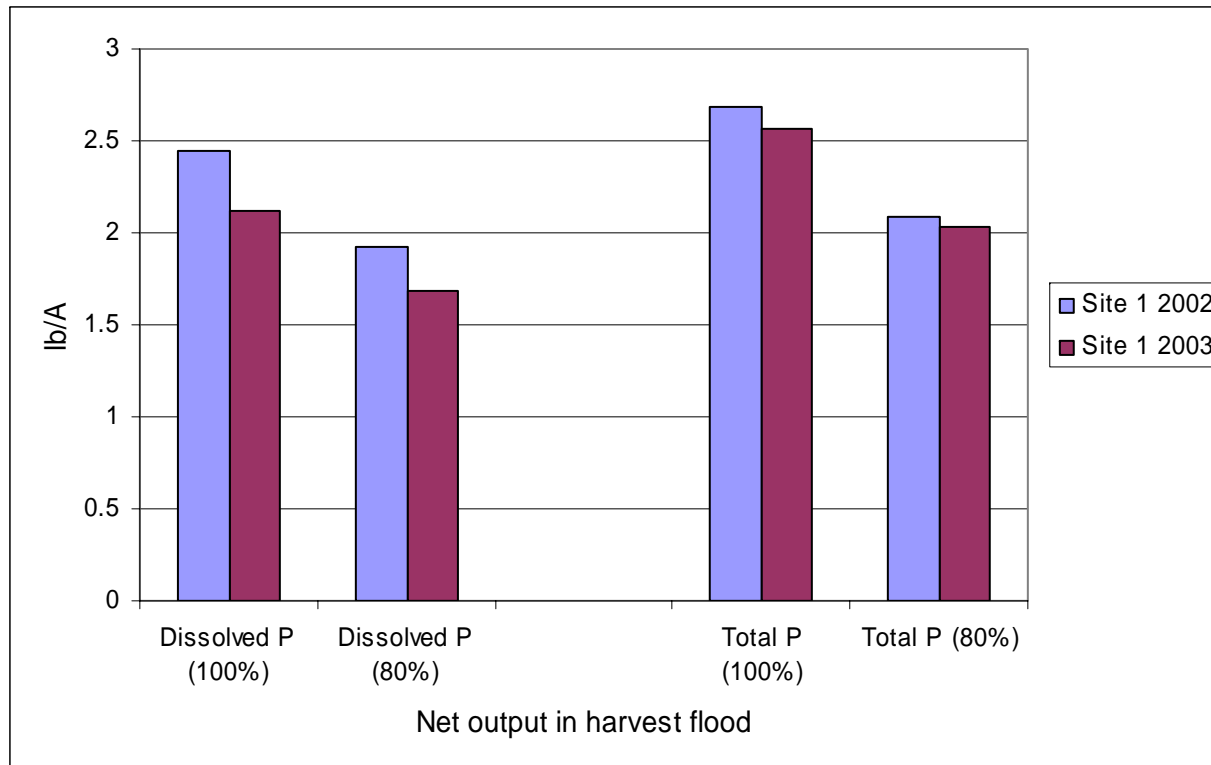
Year to year variability





Year to year variability

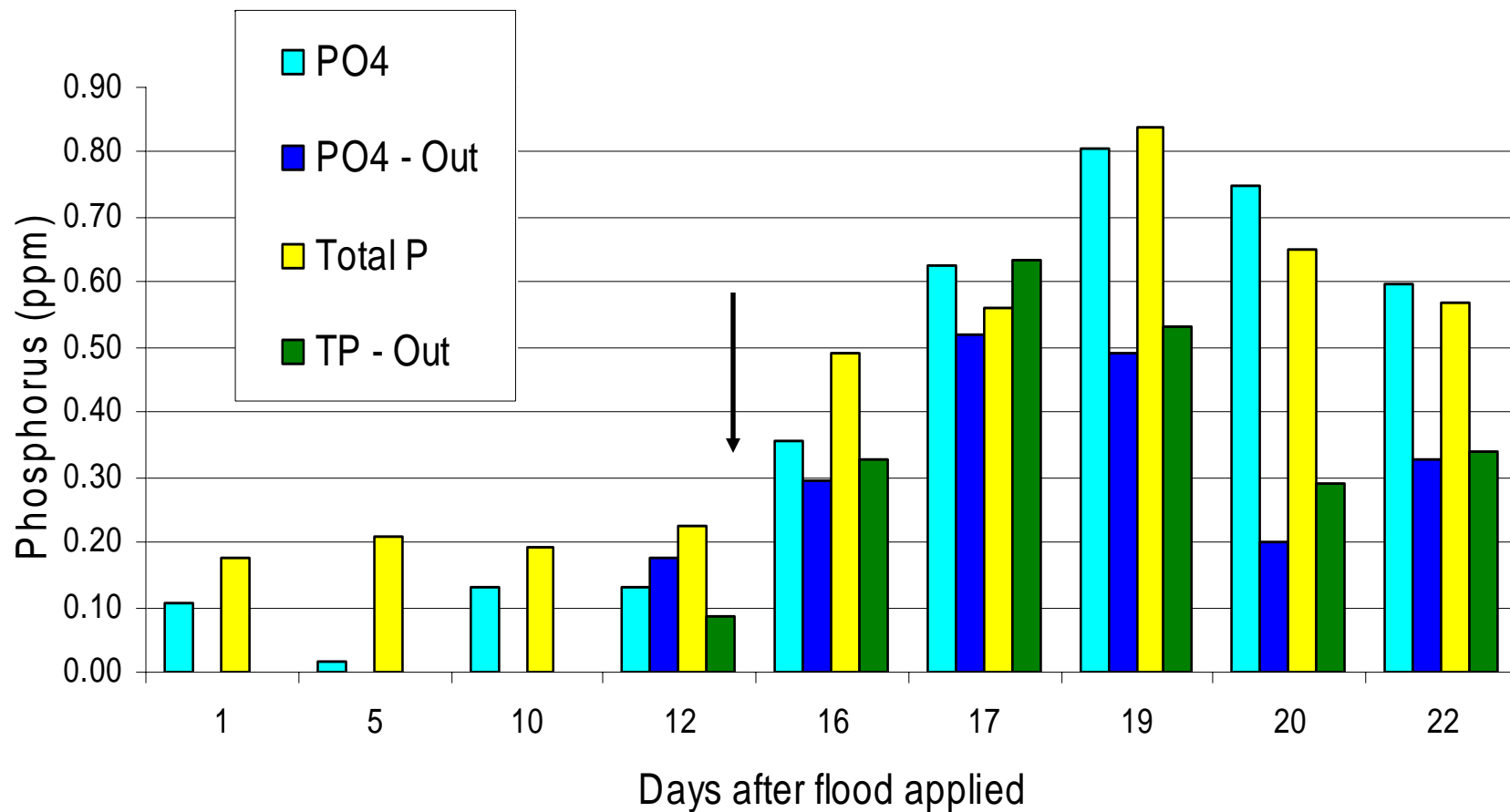
In sandy location – less P release (1 lb/A or less)



Relatively high output – harvest flood held > 1 week

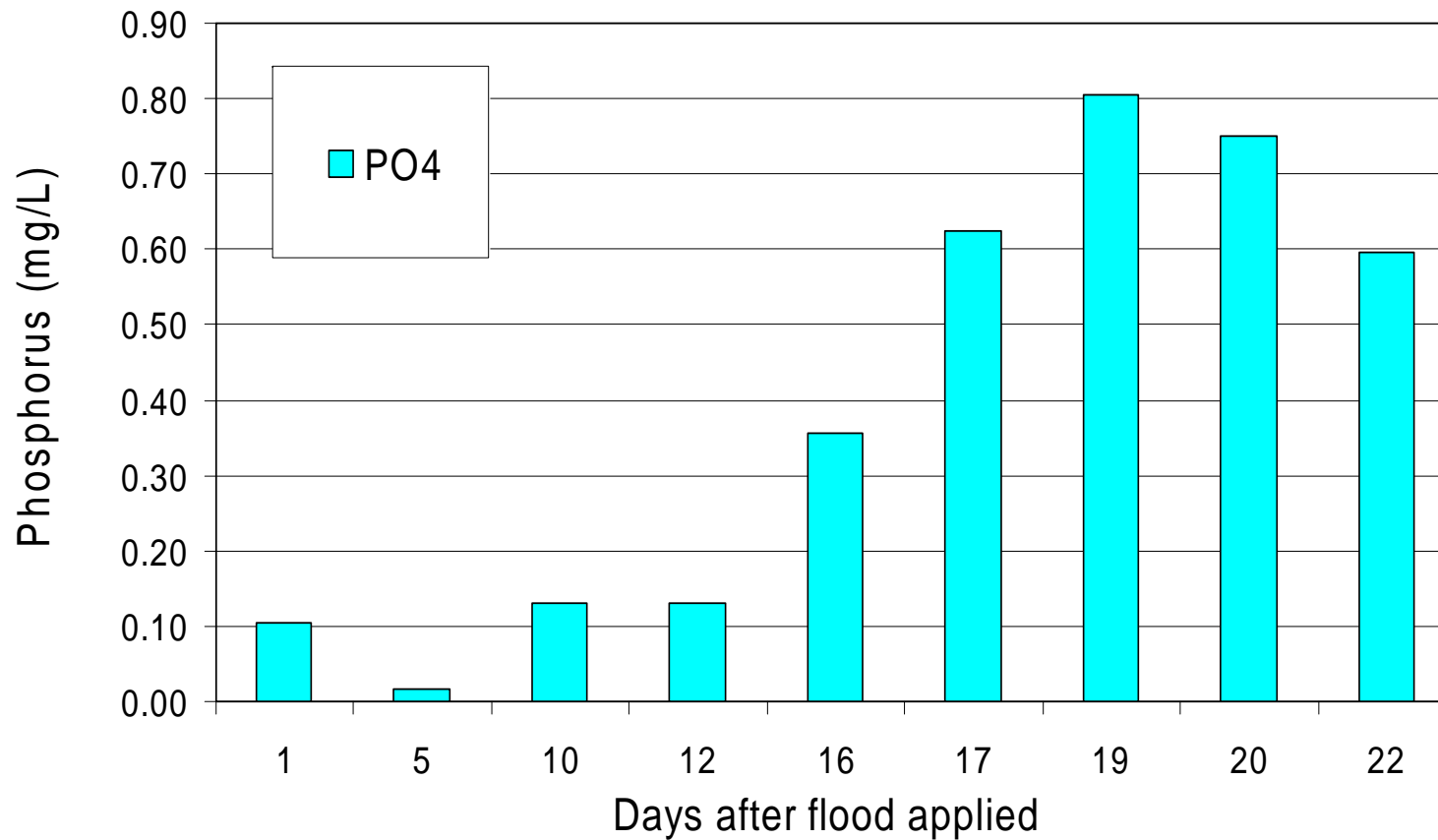


Change in water P levels during harvest flood – Site 1 2002 – Note rise after Day 12



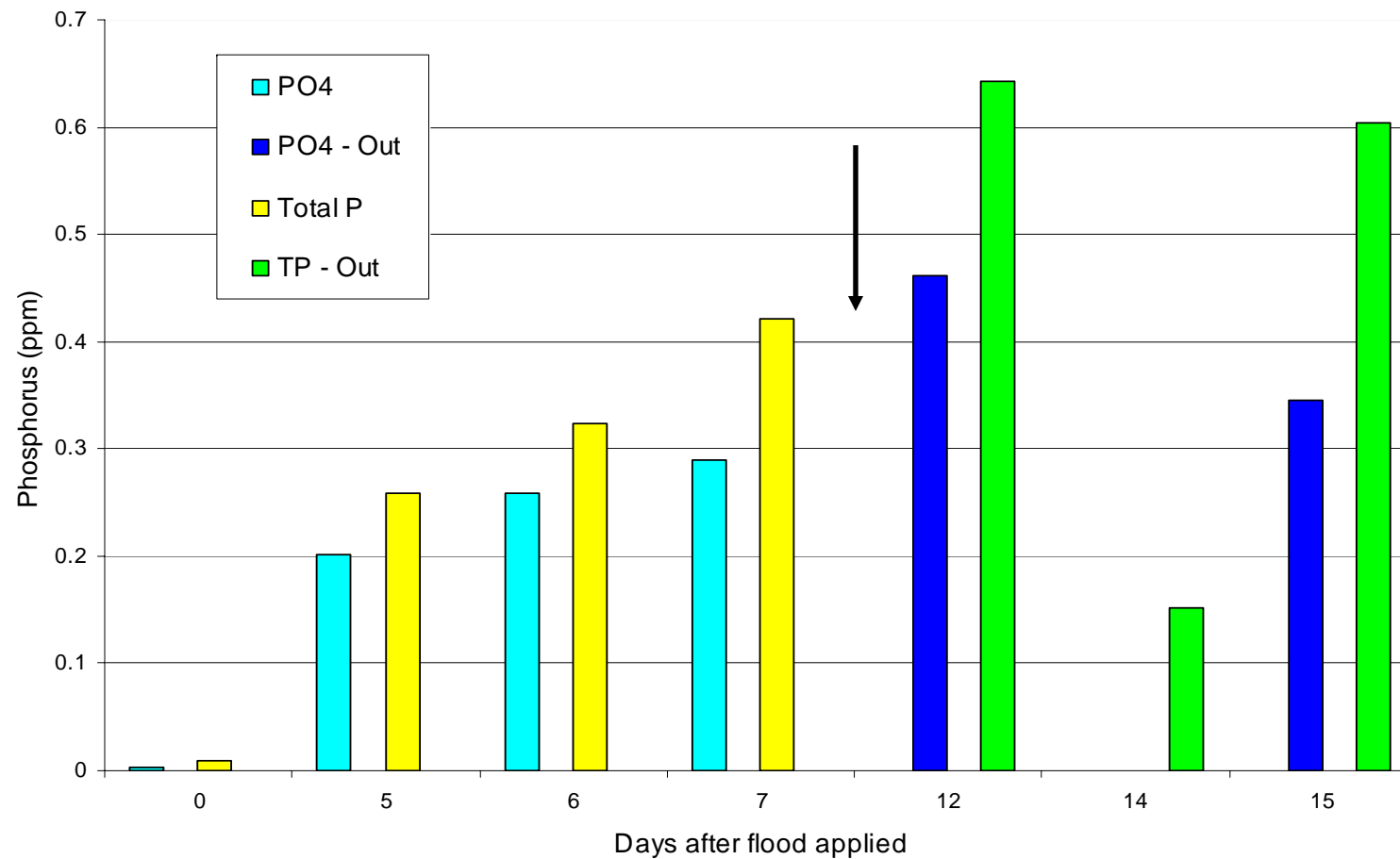


Inorganic P increase is most dramatic





Similar in 2003 – Site 1





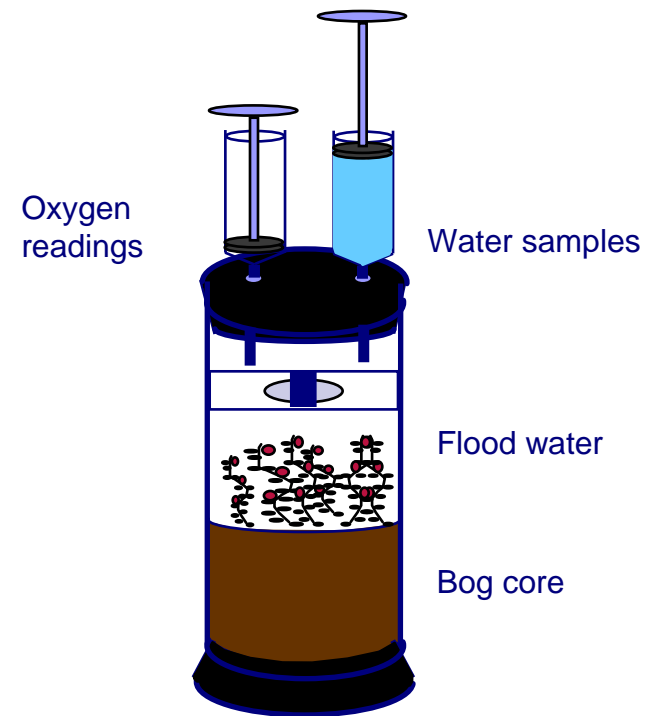
Other studies confirm P release from soil during floods

- Davenport and DeMoranville research (1990s)
 - Soil releases P when flooded
 - Amount of fertilizer P released varied with soil type (sandy soil most)

- Schlezinger, Howes, DeMoranville
 - P released to flooded soils depending on soil type, fertilizer practices, and oxygenation

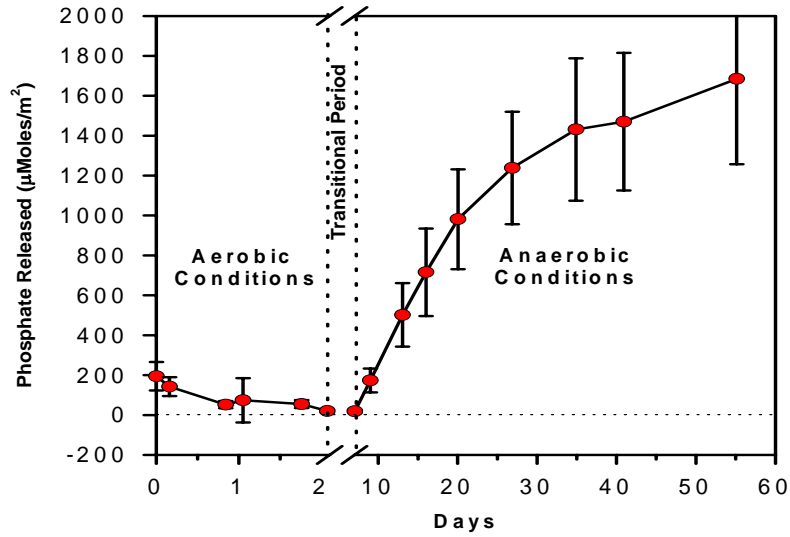
Lab experiment - design

- Varied soil types, varied fertilizer practices
- Collected soil and subjected to flooding in the lab
- Followed P release into headwater and oxygen depletion

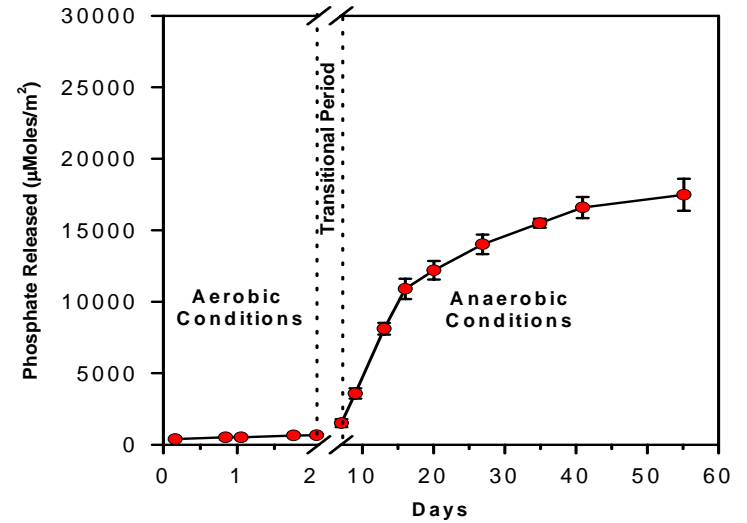




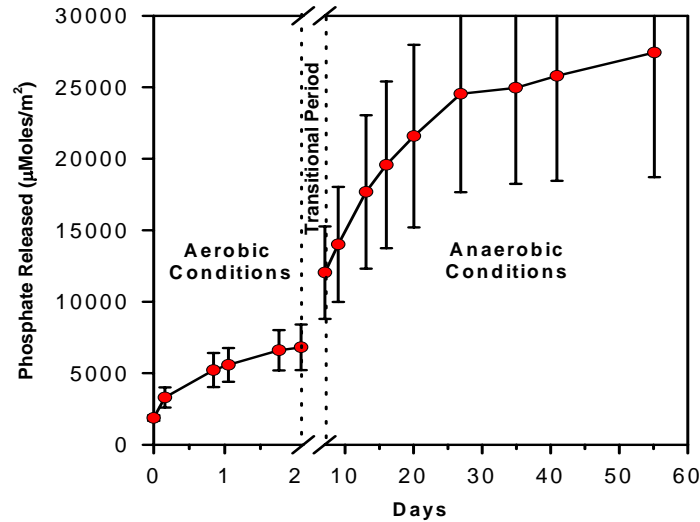
Time Course of Phosphate Release
Natural Bog



Time Course of Phosphate Release
Low P Application



Time Course of Phosphate Release
High P Application

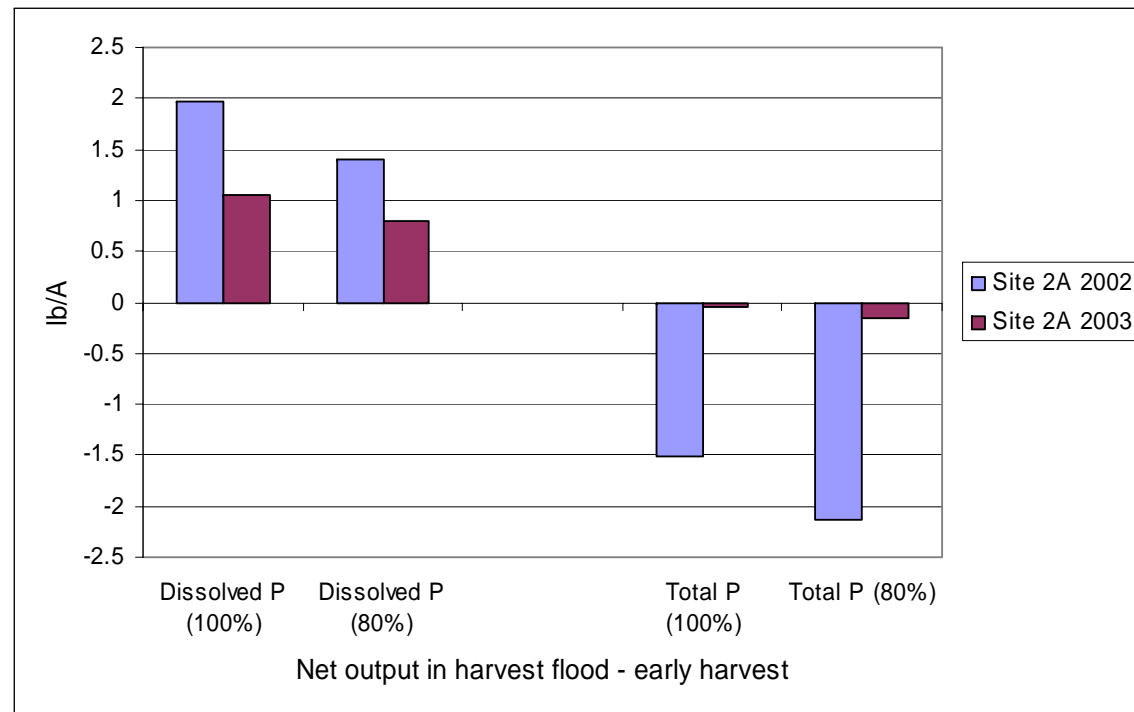


Release amount related to P added

Release increased when soil became anoxic

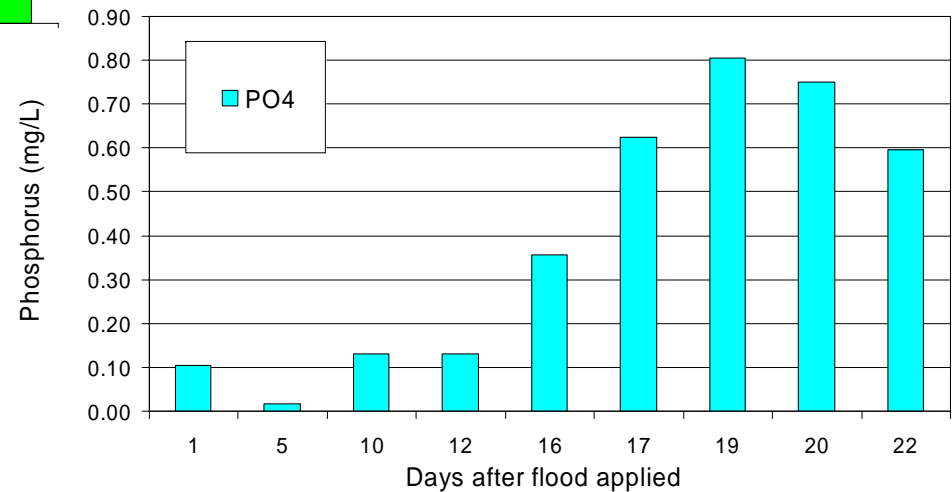
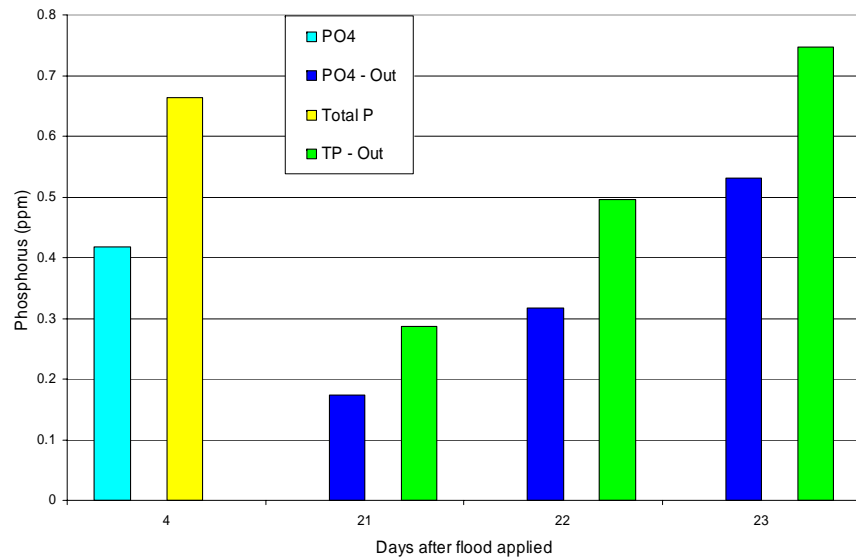


- Bogs can filter particulate P





We tried to use a bog as a living filter. Water was released slowly through a cranberry bed. The problem – inorganic P is released if water is on too long.





Summary

- Flooding is a critical activity in cranberry nutrient management planning
- Bogs can act as particulate P filters
- Anoxic conditions allow P release into flood water
- Harvest floods held longer than 1 week may risk moving inorganic P off-site.



Next steps

- Complete seasonal P budgets
- Continue to study harvest floods – look for optimum management to avoid P discharge.



Questions?